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UNITED STATES  
CONSUMER PRODUCT SAFETY COMMISSION  
WASHINGTON, DC 20207

**Memorandum**

Date: July 12, 2004

TO : Elizabeth Leland, Project Manager, ATV Petition HP-02-1

THROUGH: Hugh M. McLaurin, Associate Executive Director, *HMM*  
Directorate for Engineering Sciences  
Mark Kumagai, Director, Division of Mechanical Engineering *MK*

FROM : Caroleene Paul, Division of Mechanical Engineering *CR*

SUBJECT : Review of Voluntary Standard for All-Terrain Vehicles (ATVs)

**Introduction**

The Consumer Federation of America and eight other organizations petitioned the U.S. Consumer Product Safety Commission (CPSC) to ban the sale of four-wheel adult-size all-terrain vehicles (ATVs) intended for the use by children under age 16. The petitioner asserts that ATVs pose an unreasonable risk of injury and death to children.

This memo will summarize the requirements and rationale in the current voluntary standard for ATVs, ANSI/SVIA 1-2001 *The American National Standard for Four Wheel All-Terrain Vehicles -- Equipment, Configuration, and Performance Requirements*. This memo will also discuss the voluntary standard as it pertains to the petition.

Finally, this memo will respond to several comments from the public regarding the design of ATVs and the voluntary standard requirements for ATVs.

**Voluntary Standard**

The ANSI voluntary standard for all-terrain vehicles (ATVs), ANSI/SVIA 1 *The American National Standard for Four Wheel All-Terrain Vehicles -- Equipment, Configuration, and Performance Requirements*, was first published in 1990. The standard was developed by members of the Specialty Vehicle Institute of America (SVIA) and Polaris Industries in fulfillment of one of the requirements of the Final Consent Decrees settled in *United States v. American Honda Motor Co., et al.* and *United States v. Polaris Industries, L. P.* ANSI/SVIA 1 was revised in 2001 to include requirements for electromagnetic compatibility and sound level limits.

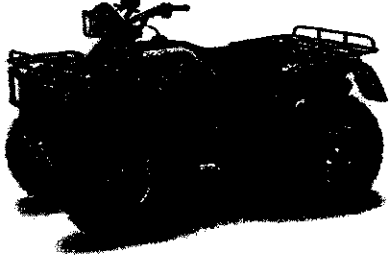
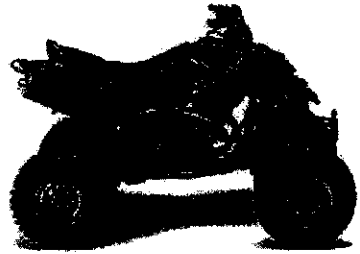

## Review of the Voluntary Standard

### Scope/Definition

The voluntary standard has requirements for equipment, configuration, and performance of four wheel ATVs. An ATV is defined as a vehicle designed to travel on four low pressure tires, having a seat designed to be straddled by the operator, having handlebars for steering control, and intended for use by a single operator. The standard subdivides ATVs into four categories:

- 1) Category G (General Use) -- for general recreational and utility use
- 2) Category S (Sport) -- for recreational use by experienced operators
- 3) Category U (Utility) -- intended primarily for utility use
- 4) Category Y (Youth) -- intended for operators under age 16
  - (a) Y-6 ATV -- for children age 6 and older
  - (b) Y-12 ATV -- for children age 12 and older

Although the standard does not use engine size to define any category of ATV, the Final Consent Decrees differentiated between adult and youth ATVs by engine sizes greater than 90cc (adult-size ATV) and engine sizes 90cc or less (youth-size ATV). At the time the Final Consent Decrees were settled, ATV engine sizes typically ranged from 90cc to 250cc, and an engine size of 400cc was considered extreme. In the current market, an ATV with an engine size of 400cc is considered mid-range, and high performance ATVs typically have engine sizes of 600cc or higher. The following are examples of typical ATVs:

General Use/Utility ATV	Sport/High Performance ATV	Youth (Y-12) ATV
		
Honda FourTrax Foreman S	Yamaha Raptor	Polaris Youth Predator
Characteristics: 433cc engine 582 lbs 77.3" x 45.3" x 45.0"	Characteristics: 660cc engine 398 lbs 72.0" x 43.3" x 45.3"	Characteristics: 89cc engine 230 lbs 56.0" x 34.0" x 36.0"

### General ATV Requirements

The configuration requirements in ANSI/SVIA 1-2001 cover service and parking brakes, mechanical suspension, clutch and gearshift controls, engine and fuel cutoff devices, throttle controls, lighting, tires, operator foot environment, electromagnetic compatibility, and sound level limits. Vehicle performance requirements are specified for service and parking brake operation, pitch stability and, for youth ATVs, requirements for maximum speed capability and for speed limiting devices.

The general configuration requirements are intended to standardize location, color scheme, and method of operation of the main controls of an ATV. The basic control configuration was adopted from common practices for standard off-road motorcycles and/or snowmobiles (the two vehicles that are most similar to ATVs). Standard controls, gear indicators, and an electric start interlock are all intended to ensure that the operator can more easily start, stop, and operate an ATV regardless of vehicle manufacturer.

### Youth ATV Requirements

Other than a description of the age range for which a youth ATV is intended (children age 6 and older for Y-6 and children age 12 and older for Y-12), the only requirements that distinguish a youth ATV from an adult ATV are speed limiting capabilities, maximum speed capabilities, and brake stopping distance. The following table summarizes the requirements for each category ATV:

Category	Age range (years)	Speed Limit Capability	Maximum Unrestricted Speed	Brake Stopping Distance (feet)
Y-6	6 and older	10 mph	15 mph	less than or equal to value based on braking test speed
Y-12	12 and older	15 mph	30 mph	constant multiplied by square of braking test speed
G, S, and U	16 and older	none required	none required	constant multiplied by square of braking test speed

### *Section 6.1 Speed Limiting Devices*

All Category Y ATVs must have a means of limiting the speed of the ATV, and the speed limiting device must require the use of tools for adjustment or removal. Current youth ATVs meet this requirement by limiting the throttle lever travel with a set screw and lock nut. CPSC staff believes that this method of speed limiting is not practical and is likely to be disabled by youth ATV operators. In practice, when the throttle is restricted to meet the speed limit requirements, the vehicles tested by CPSC staff lacked enough power to move from a standstill under load. CPSC staff believes the speed limiting requirement should mandate adequate vehicle performance to ensure that the speed limiting device is practical and more likely to be used. If the speed restriction results in inadequate performance the user is likely to disable the device.

### *Section 7 Service Brake Performance*

Category Y-12 ATVs must exhibit at least one stop that demonstrates an average braking deceleration of 0.6g or greater. Category Y-6 ATVs must exhibit at least one stopping distance that is equivalent to a value based on the braking test speed. Field tests by CPSC staff on several youth ATVs have determined that the test procedures do not produce repeatable results. CPSC staff has made recommendations to SVIA to address issues related to braking test repeatability.

### Warnings

ANSI/SVIA 1-2001 does not include a section on labels. The ATV consent decrees and subsequent voluntary action plans provided labeling requirements that warn against risky behavior and inappropriate vehicle use, as well as appropriate age range information. A typical

label warns against the following actions on an ATV: use on paved roads, carrying passengers, use while intoxicated, and use without helmet and protective gear. All ATVs have labels that warn against the use of the ATV by children below the appropriate age for the particular ATV: labels warn against the use by children below the age of 16 for adult-size ATVs, below the age of 12 for Y-12 ATVs, and below the age of 6 for Y-6 ATVs. Warning labels and owner's manual warnings have become the industry standard as companies continue to follow the expired consent decrees, but no requirements are included in the voluntary standard.

In a letter to SVIA dated March 12, 1999, CPSC staff requested that SVIA include vehicle labeling and warnings in the voluntary standard. However, the current standard does not address this issue.

## **Conclusion**

The voluntary standard for ATVs, ANSI/SVIA 1-2001 *The American National Standard for Four Wheel All-Terrain Vehicles -- Equipment, Configuration, and Performance Requirements*, addresses children's use of ATVs by providing performance requirements for youth-size ATVs. The performance requirements for youth-size ATVs place restrictions on the maximum speed, mandate speed limiting capabilities, and define brake stop distances. CPSC staff believes the requirements for speed limiting devices should be improved to ensure adequate performance of the vehicle under normal loads and operating conditions, and the requirements for brake stop distances should be improved to ensure reproducible and accurate measurements.

The current voluntary standard does not address the hazard of children driving adult-size ATVs. Manufacturers continue to comply with warning label requirements that were developed to satisfy expired consent decrees, and these labels warn against the use of adult-size ATVs by children under 16 years of age. However, these requirements are not in the voluntary standard.

## **Response to Public Comments**

1. *ATVs are inherently unstable and difficult to drive safely.*

**Comment:** Several comments state that an ATV's high center of gravity, short wheel base, solid rear axle, short turning radius, and high-powered engine make ATVs difficult to operate for a child under 16 years of age.

**Response:** An ATV does have a high center of gravity, short wheel base, and solid rear axle. In addition, ATVs have low pressure tires that affect vehicle dynamics due to variable tire/soil/pavement interface. The amount of flex in a tire and the conditions at the tire/surface contact area fundamentally affect the directional control and stability of a vehicle. For instance, ATVs exhibit both understeer and oversteer handling characteristics while turning at different speeds. Understeer is the tendency of a vehicle to turn less than the steering angle input. The operator must continue turning the steering wheel (or handlebar) to maintain the turn in an understeering vehicle. Oversteer is much more responsive than understeer to the operator's steering angle input. The operator must reduce the steering input to maintain the turn in an oversteering vehicle. Changes in steering response are one of many factors to which an operator must adjust while operating an ATV.

Accelerating and braking an ATV cause weight transfer (either forward and backward or side to side) and create forces that ultimately can result in vehicle tip over or loss of control. Vehicle handling is a function of vehicle speed, acceleration or braking forces, steering response, weight transfer, suspension response, and probably most importantly, operator input. To operate an ATV safely, a skilled and alert driver must automatically adjust to changes in the vehicle dynamics by slowing down, speeding up, adjusting the steering angle, and/or shifting his/her weight to change the system's center of gravity. However, the skills required to operate an ATV are not obvious, and an inexperienced driver may not be aware of all the factors let alone adjust to them in order to operate the vehicle safely.

## 2. *Voluntary Standard*

**Comment:** Several comments state that the voluntary standard does not address the design flaws in ATVs. In addition, several comments state that the absence of a mandatory standard for ATVs precludes ATV riders from the safety benefits that automobile passengers and riders enjoy.

**Response:** As noted earlier, CPSC staff believes there are some aspects of the ATV standard that could be improved, including the repeatability of braking tests and the adoption of cautionary warnings. These items, however, are not directly relevant to the petitioner's request to ban the sale of adult-size ATVs intended for use by children under 16 years of age. CPSC staff believes that efforts to improve the voluntary standard should continue, but staff also recognizes that a voluntary standard will not eliminate the hazard of children under 16 years of age using adult-size ATVs.

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## **All-Terrain Vehicles (ATVs): Market Information**

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U.S. Consumer Product Safety Commission  
July 2004**



## All-Terrain Vehicles (ATVs): Market Information

### **Introduction**

This report describes the U.S. market for all-terrain vehicles (ATVs). It is intended for the use of the U.S. Consumer Product Safety Commission (CPSC) in its consideration of Petition CP-02-4/HP-02-1, which requests a ban of the sale of adult-size four-wheel all-terrain vehicles sold for the use of children under 16 years old.<sup>1</sup>

Specifically, this report discusses:

- ATV manufacturers, distributors, and importers,
- selected ATV design characteristics,
- sales and manufacturers' market shares,
- retail prices and places of purchase,
- the market for used ATVs, and
- safety information that consumers receive at time of purchase.

Information sources for this report included trade press, Internet Web sites, corporate financial reports filed with the U.S. Securities and Exchange Commission (SEC), corporate press releases, comments submitted to the CPSC in response to *Federal Register* notices, and testimony from the CPSC ATV Safety Hearing held in Morgantown, West Virginia, on June 5, 2003.

### **ATV Manufacturers/Distributors/Importers**

The CPSC Directorate for Economic Analysis (EC) has identified 32 domestic and foreign manufacturers of model-year 2003 ATVs, an increase of about 60 percent relative to the number that produced ATVs in the 2001 model year. The CPSC staff estimates that these 32 manufacturers account for more than 98 percent of the sales of new ATVs in the U.S.

Sixteen of these 32 manufacturers have business operations in the U.S. While some produce ATVs in the U.S., others produce ATVs abroad but have a U.S. subsidiary or affiliate that distributes them in the U.S. Four of the 16 companies are North American, nine are Asian, and three are Western European. The ATVs sold by these firms generally carry the manufacturer's brand name.

The remaining 16 of the 32 manufacturers are foreign manufacturers that export ATVs (either complete or needing assembly) to independently owned American importers. These importers distribute the ATVs throughout the U.S., sometimes under the name of the foreign manufacturer or sometimes under their own name or that of a private labeler. One of these 16 companies is South Korean; the remaining companies are Taiwanese or Chinese. According to one source, the U.S. is the largest market for Taiwan-made

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<sup>1</sup> "In the Matter of the Petition of Consumer Federation of America, To Ban All-Terrain Vehicles for Use By Children under 16 years old and To Provide Refunds for Consumers", submittal from Rachel M. Weintraub, Attorney for petitioner, Consumer Federation of America, August 19, 2002.

ATVs,<sup>2</sup> with ATV production becoming an increasingly profitable production segment for Taiwan's motorcycle industry; one report indicates that nearly all of the motorcycle companies in Taiwan have now entered the U.S. ATV market.<sup>3</sup>

Many of the foreign manufacturers entered the U.S. market within the past five years. Nearly all of these companies entered the market only with a "mini-quad" or a youth ATV model, i.e., one with an engine displacement of 90 cubic centimeters (cc) or less; they did not enter the U.S. market with any adult ATV models. About five years ago, the youth ATV market was a niche market, since the companies that already were well-established players in the U.S. market were focusing their product lines on adult ATVs. As more consumers purchased youth ATVs, additional foreign companies entered the U.S. youth ATV market, and some of the well-established companies in the market added youth ATVs to their product lines.

### ***ATV Models: Selected Design Characteristics***

The ATV market is growing, with easy entry and exit. While the established players in the U.S. ATV market tend to have one product line-up that is announced at the beginning of the model year, other manufacturers introduce models as soon as they find a firm in the U.S. who is willing to import or distribute their ATVs.<sup>4</sup>

Any data about the number and characteristics of the ATV models that are currently available for purchase by consumers is at best short-lived, since new firms and models are frequently entering the market. EC staff found it useful to take a snapshot of the market at different points in time and then compare those snapshots to find out if any movements in the market could be discerned. Focusing on three design characteristics that are pertinent to the petition (numbers of youth and adult models, engine displacement, and designed seating capacity), EC staff "took" a snapshot of the market in late 2003 and compared it with one that EC staff took in early 2001. The information from that comparison is provided below.

### **Youth and Adult Models**

In late 2003, there were 235 2003-model year ATVs available to the U.S. consumer.<sup>5</sup> About 95 of these, or about 40 percent, were youth models. As shown in Table 1, the total number of 2003 ATV models is about 80 percent higher than in 2001, with the number of youth models being about 104 percent higher. Of the approximately 95 youth

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<sup>2</sup> "Taiwan's ATV Production Increases with Demand," Interface Global Corporation Pte. Ltd., Singapore, <http://www.motorcyclesb2b.com/html/editor/market/articles/motomratv.htm>.

<sup>3</sup> Quincy Liang, "ATVs Pump Up Sales for Local Motorbike Makers", c. 2002, China Economic News Service, Taiwan, <http://www.cens.com/linerpt/20020730064.html>.

<sup>4</sup> Entry into the market is made easier because many models are copies of each other. Many models, particularly those coming from newer entrants in Asia, differ only slightly from each other. See "One-stop shop for motorcycles, parts, and accessories," *Asian Hardwares*, June 3, 2003, c. 2003, Trade Media Holdings Ltd.

<sup>5</sup> This number is based on the brand name models available on the market and is intended to include the models a consumer would find if he/she were purchasing a new ATV. It includes models made by the same manufacturer but with different brand names.

models available in 2003, nearly 49 percent were models for children 11 years old and under and the remaining 51 percent were for youth between the ages of 12 and 16.

**Table 1**  
**Number of Youth and Adult ATV Models: Model-Year 2001 and Model-Year 2003**

Type of ATV	Model-Year 2001	Model-Year 2003
Total	131	235
Adult	85	141
Youth	46	94
Age 6+	21	46
Age 12+	25	48

While most youth models are manufactured by recent market entrants, nearly all of the 32 manufacturers include at least one youth model in their product line-up.

#### Engine Displacement

Table 2 compares the availability of model-year 2001 ATVs, by engine displacement, with those of 2003. The number of models available to the public has grown in all but the 401-500 cc category. In 2003, there were models ranging in size from about 50 cc engine displacement to over 700 cc. The number of models in the 91 - 125 cc has quadrupled, while that in the 126-250 cc categories has nearly tripled. The number of ATV models in the >500 cc category has doubled.<sup>6</sup>

**Table 2**  
**Distribution of Year 2001 and Year 2003 ATV Models by Engine Displacement**

Engine Displacement (cc)	Model-Year 2001	Model-Year 2003
All engine sizes	131	235
<70	21	46
71 - 90	25	48
91 - 125	5	20
126 - 250	18	50
251 - 400	31	43
401 - 500	26	18
>500	5	10

The recent market entrants are responsible for most of the increase in the number of ATV models with engine sizes less than 250 cc. Many of these companies are motorcycle manufacturers in Taiwan, who, until this past year, were restricted by a law that did not allow motorcycles with engines over 150 cc to be produced. Because the technology used in the manufacture of ATV engines is similar to that of motorcycles, companies in

<sup>6</sup> See also "Engines Keep Getting Bigger", October 8, 2002, *All-Terrain Vehicle* magazine, South Minnetonka, MN, <http://www.atv-mag.com/news/news/2002oct/oct08engines.html>.

Taiwan were limited to the production of smaller engine-size ATVs. With the lifting of the law, Taiwanese manufacturers now are making larger motorcycles **and** ATVs. Trade press indicates that these companies will be introducing larger size ATVs to the U.S. market in coming years.<sup>7</sup>

Conversely, the largest engine-size ATVs, i.e., those in excess of 400 cc, currently are made almost exclusively by the companies that are the established long-time players in the U.S. ATV market.

### Seating Capacity

Until a year ago, all ATVs were designed to have only one rider. In fact, a key component of the 1988 consent decrees between CPSC and the ATV distributors was the placement of a warning label on the ATV indicating that the ATV is designed to have only one person on it – the driver.

One manufacturer, Bombardier, discovered through surveys that up to 75 percent of ATV drivers in Quebec, Canada, ride with a passenger and that most utility ATV users would be interested in purchasing an ATV that could carry two people.<sup>8</sup> As a result, Bombardier introduced an ATV designed for two riders, with the passenger sitting behind the driver.

Bombardier has since increased the number of ATV models it produces that are designed for two people. These models are large adult models, with engine sizes of over 400 cc, and an extended wheelbase to accommodate a passenger. The operator is able to get on and off the vehicle without disturbing the passenger, and the two riders can be seated totally independent of one another. The passenger has access to handles on each side of the rear rack of the ATV and can shift his or her weight to maintain their balance. The manufacturer recommends that the passenger be 12 years of age or older.<sup>9</sup>

Another manufacturer, Arctic Cat, is showing a "two-up" (i.e., two riders, one seated behind the other) ATV in its 2004 product year models. Although a third manufacturer, Yamaha, is reported by some trade press to be producing a "two-up" ATV for 2004, the manufacturer refers to the vehicle as an off-road utility vehicle and does not list it as one of their 2004 model year ATVs.<sup>10</sup>

The introduction of these vehicles into the market is leading to legal and definitional questions as to whether they are a separate type of off-road vehicle or whether the definition of "ATV" should be expanded to include them. At the time that Bombardier introduced the two-up ATV to the market, there was no Canadian or U.S. federal

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<sup>7</sup> "With Floation, Her Chee Forges Ahead", September 13, 2002, Infotrade Media Company, Taichung 406, Taiwan, [www.trade-eye.com](http://www.trade-eye.com).

<sup>8</sup> Ray Sedorchuk, "Two More Go Two-up: Bombardier's Outlander & Quest Join the Traxter," (Inside the ATV Market), September 2003, *Dealernews*, Advanstar Communications, Inc. New York, New York, [www.advanstar.com](http://www.advanstar.com) and the *Dirt Wheels* staff, "Bombardier Trax-Max Two-Seater Quad: A Machine Purpose (sic) Built for Two", October 2002, *Dirt Wheels*, Hi-torque Publications, Valencia, CA.

<sup>9</sup> Ray Sedorchuk, *op cit*.

<sup>10</sup> See <http://www.yamaha-motor.com>

legislation that banned two-up ATVs; only the state of Iowa banned them. However, legislation reportedly allowing two-up riding passed in 2002 in four states and was pending in five.<sup>11</sup>

### ***Industry Sales and Manufacturers' Market Shares***

#### **Industry Sales**

There are several publicly available sources of ATV industry sales data: press releases from the Specialty Vehicle Institute of America, trade press articles (that rely on the Motorcycle Industry Council for sales information), and corporate 10-K reports. Table 3 provides sales data for the years 1996 through 2003. These estimates, however, may not account for all of the units sold by the newer entrants into the market; unlike the established companies in the industry, most of the newer market entrants do not report their sales volumes to trade organizations or in corporate financial reports.<sup>12</sup> Thus, the sales volumes listed below may be underestimated, especially in the years since 1998 when many new companies entered the market.

**Table 3**  
***Annual U.S. Retail Sales of New ATV's and Annual Percent Change: 1996 - 2003<sup>13</sup>***

Year	Annual Sales (Units)	Annual Percent Change
1996	326,513	
1997	377,339	15.6
1998	429,414	13.8
1999	543,932	26.7
2000	648,646	19.3
2001	729,054	12.4
2002	759,585	4.2
2003	815,771	7.4

The data in Table 3 show the dramatic yearly increases in ATV sales from 1996 through 2001. Although annual rates of increase slowed in 2002 and 2003, sales of ATVs

<sup>11</sup> Sedorchuk, op cit., *The Dirt Wheels* staff, op cit. Also, it was noted by writers for *All-Terrain Vehicle* magazine that up to 30 percent of riders were carrying a passenger on an aftermarket king/queen saddle. See "2-Passenger Cat Still not Released," November 25, 2002, *All-Terrain Vehicle* magazine, South Minnetonka, MN, [www.atv-mag.com/news/news/2002nov/nov25twoup.html](http://www.atv-mag.com/news/news/2002nov/nov25twoup.html).

<sup>12</sup> Robin Hartfiel, "The brands of summer: a look at many mini ATV manufacturers. (ATV overview)." in September 2002, *Dealernews*, Advanstar Communications, Inc., New York, New York, [www.advanstar.com](http://www.advanstar.com).

<sup>13</sup> "Has the boom busted? Progress report, Part 1. (Inside the ATV market), *Dealernews*, August 2003, Advanstar Communications, Inc. New York, New York, [www.advanstar.com](http://www.advanstar.com) and Gale Group, Thomson Gale, Farmington Hills, MI, [www.gale.com](http://www.gale.com) and Don J. Brown, "Another solid year – at last: sustained bad weather headed off an otherwise even better year. (2003 Market Recap)", January 2004, *Dealernews*, [http://www.findarticles.com/cf\\_0/m3323/1\\_40/112656476/p1/article.jhtml](http://www.findarticles.com/cf_0/m3323/1_40/112656476/p1/article.jhtml), [http://www.findarticles.com/cf\\_0/m3323/1\\_40/112656476/p2/article.jhtml](http://www.findarticles.com/cf_0/m3323/1_40/112656476/p2/article.jhtml).

in the U.S. were higher than the previous record sales volumes of approximately 550,000 units sold in the mid-1980s.

The established companies in the market account for a predominant share of unit market sales. Based on publicly available sources, the market shares of the seven major manufacturers account for roughly 90 percent of the unit sales volume. The remaining ten percent is accounted for by the foreign companies who have entered the market in the last five years.<sup>14</sup>

According to Polaris Industries, worldwide sales of ATVs in 2003 totaled 1,041,000 units.<sup>15</sup> Thus, in 2003, the U.S. sales volume represented about 80 percent of total world sales. It is anticipated that the U.S. share of the world market will remain large, although sales of ATVs in the European Community are expected to increase due to increased accessibility to markets and to recent laws allowing the use of ATVs on public roads.<sup>16</sup>

### Manufacturers' Market Shares

A recent press release indicates that American Honda held about 30 percent of the U.S. ATV market in 2003.<sup>17</sup> Polaris reportedly is second, with an approximate 26 percent share.<sup>18</sup> Yamaha holds about a 24 percent market share. Arctic Cat and Kawasaki each hold about a seven percent market share, and Suzuki holds five percent. Bombardier is estimated to hold a one percent share.<sup>19</sup> However these shares of market are based on total market retail sales that do not include the sales of many of the new entrants into the market. When these sales are included, the market shares of the above companies decrease, but the relative position of these companies in the market remains the same.

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<sup>14</sup> Suzanne Tu, and Julian Clegg (translation), "Choosing the Hard Way – Differentiation Puts Her Chee Ahead", September 10, 2003, Infotrade Media Co., Ltd., Taichung 406, Taiwan, [http://www.mototrader-asia.com/report/index.php3?news\\_func=show&news\\_goid=27](http://www.mototrader-asia.com/report/index.php3?news_func=show&news_goid=27); Interface Global Corporation, Ltd., op.cit.; Quincy Liang, op.cit.; "ATV Maker Din Li Closing in on 30,000 Annual Target", September 13, 2002 Infotrade Media Co., Ltd., Singapore, [www.mototrader-asia.com](http://www.mototrader-asia.com), [www.trade-eye.com](http://www.trade-eye.com); and Robin Harfiel, op.cit.

<sup>15</sup> Polaris Industries, 2003 Form 10-K Annual Report filed with the U.S. Securities and Exchange Commission March 11, 2004, <http://www.sec.gov/Archives/edgar/data/931015/000095013404003298/c82497e10vk.htm>.

<sup>16</sup> ATVs must meet the European Economic Community's standard 92/61/EEC. See "The European Market for ATVs: Who are the Tomorrow Winners?" October 22, 2003, Infotrade Media Co., Ltd., Taichung 406, Taiwan, [http://www.mototrader-asia.com/report/index.php3?news\\_func=show&news\\_goid=30#item30](http://www.mototrader-asia.com/report/index.php3?news_func=show&news_goid=30#item30) and "Four-Wheel ATVs Meet European Homologation Standard", April 25, 2003, *Asian Sources Hardwares*, April 25, 2003, Trade Media Holdings Ltd., Singapore, [www.hardwares.globalsources.com/am?page=articlehome\\_cdev](http://www.hardwares.globalsources.com/am?page=articlehome_cdev)

<sup>17</sup> Honda of South Carolina Mfg., Inc., "Honda Builds 1 Millionth ATV", January 19, 2004, [http://www.powersportsnetwork.com/enthusiasts/news\\_article.asp?id=1943](http://www.powersportsnetwork.com/enthusiasts/news_article.asp?id=1943). It must be noted that this calculation is based on total sales figures which do not include the sales of foreign entrants into the market.

<sup>18</sup> "Polaris stock rises on rosy forecast", April 9, 2002, Minneapolis, MN, *The Minneapolis-St. Paul Business Journal*, <http://twincities.bizjournals.com/twincities/stories/2002/04/08/daily19.html>

<sup>19</sup> Current publicly available information for Yamaha, Kawasaki, Arctic Cat, American Suzuki, and Bombardier were not available; the most recent published data is from October 31, 2002, *Ehlert Powersports Business*, as published in "John Pellan's ATV News Column – On the Fast-Trak 12-31-02 ATV OEM Leaders", Cleveland, OH, ATVScene.com (ATV e-zine), <http://www.atvscene.com/on-the-fast-trak/12-31-02.htm>.

E-Ton America, Din Li, and Her-Chee are estimated to have the largest portion of the approximate 10 percent share of the market that is held by the foreign entrants into the market.<sup>20</sup> EC staff estimates that U.S. sales of these companies' ATVs combined range from 60,000 to 100,000 units.

### Sales of ATVs, by State

The state with the largest unit volume of ATV sales in 2003 was California with about 57,900 units sold.<sup>21</sup> About 44,000 ATVs were sold in Texas, and about 34,000 in New York. Sales in Pennsylvania were nearly 34,000, and sales in Minnesota were about 33,000 units. In 2003, the largest rate of increase in sales was in Alaska, where sales increased from about 3,300 units in 2002 to about 9,000 units in 2003.

In 2003, sales of ATVs declined in 29 of the 50 states. Percentage decreases ranged from 0.1 percent in Illinois, Indiana, and Minnesota to 43.7 percent in North Carolina, with a median percentage decrease of 8.4. Percentage increases in 21 states and the District of Columbia in 2003 ranged from 0.04 in Kansas to 270.8 percent in Alaska.

### The Nature of Competition in the ATV Market

The ATV market reportedly is very competitive, with important competitive factors being performance, styling, fit and finish, brand loyalty, reliability, durability, and price.<sup>22</sup> However, some analysts believe that price is the primary factor in competition among the producers of youth ATVs. "With the youth models, everything's price-driven. The 50 cc and 90cc models are pretty much disposable products, whereas big-ATV purchasers are looking for a machine that's going to give them long-term reliability."<sup>23</sup>

### ***Retail Prices and Places of Purchase***

The suggested retail prices for year 2004 models from the major manufacturers range from approximately \$2,000 to nearly \$8,000, with the median price being about \$5,150. The manufacturer's suggested retail prices (MSRPs) for year 2004 youth models range from about \$1,800 to \$2,500, with a median price of about \$2,300.

ATV manufacturers sell their product through networks of dealers. For some companies, these networks include affiliated motorcycle dealers. For others, the dealer

<sup>20</sup> See references in Footnote 14.

<sup>21</sup> <http://www.paatving.com/Articles/stateatvsales/pasalesstats.asp> . and Don J. Brown, "ATV/Dirtbike by State. (Research)," January 2004, *Dealernews*, Advanstar Communications, Inc., New York, NY, [http://www.findarticles.com/cf\\_0/m3323/1\\_40/112656516/p1/article.jhtml](http://www.findarticles.com/cf_0/m3323/1_40/112656516/p1/article.jhtml).

<sup>22</sup> Polaris Industries Form 10-K Report, op. cit., and Arctic Cat Inc., Form 10-K report filed with the U.S. Securities and Exchange Commission, June 27, 2003,

<http://www.sec.gov/Archives/edgar/data/719866/000110465903013231/0001104659-03-013231-index.htm>

<sup>23</sup> Thomas Roderick, "Asian invasion: is Japan being out-Japanesed by the Chinese? (Inside The ATV Market)" September 2003, *Dealernews*, Advanstar Communications, Inc., New York, NY, [www.advanstar.com](http://www.advanstar.com) . Also U.S. Environmental Protection Agency, "Draft Regulatory Support Document: Control of Emissions from Unregulated Nonroad Engines", September 2001, Washington, DC, p.2-12 to 2-16, <http://www.epa.gov/otaq/regs/nonroad/proposal/chptr-2.pdf>

network includes lawn and garden shops, boat and marine product dealers, motor sports equipment dealers, and farm implement dealers.

ATVs now are sold online at various Web sites. Some Internet sites provide free shipping. The ATV models sold on the Internet generally are manufactured by new entrants rather than by established firms. As a result, most of the models sold on the Internet are youth models or models in the lower cc size categories. Information is not available to determine the proportion of industry sales that are made through the Internet; however, given the newness of Web site sales, it is likely to be small. Generally, for a given size category, prices for ATVs purchased through the Internet tend to be somewhat less than those for ATVs sold through established dealerships.

#### The Market for Used ATVs and for Aftermarket Equipment

According to the 2001 ATV exposure survey, there are about 5.6 million ATVs in use; about 2.5 million (or about 45 percent) were purchased used, with about 83 percent of these being purchased from a previous owner.<sup>24</sup> Used ATVs also can be purchased through dealerships and through online trading Web sites, including e-Bay.

The ATV aftermarket is strong. Various items are available to add onto or to modify ATVs, including, for example, front and rear racks, brush guards, rear screens. A recent series of articles discussed modification options for the youth ATVs.<sup>25</sup> Most modifications are made to increase the performance potential of the mini quads. Sometimes the modifications are made for competitive racing purposes. Sometimes they are made to modify a smaller size ATV rather than move up to a larger size ATV and to "keep up with a young rider's increasing growth and riding ability."<sup>26</sup>

#### *Safety Information That Consumers Receive At Time of Purchase* Information About Age Guidelines

The companies participating in the Voluntary Action Plans with CPSC require their dealers to inform purchasers of ATVs about the age size guidelines. These guidelines recommend that children under 12 ride only ATVs with engines of 70 cc or less displacement and that children 12 through 16 years should ride ATVs with engine displacement that is 90 cc or less.

Companies that entered the market within the last five years were not in the market at the time the Voluntary Action Plans were developed. However, since these companies sold only youth models, they did not necessarily need to provide information about the age guidelines. It appears, however, from Web site information, that these companies provide information at their dealerships about the age recommendations, and at least one

<sup>24</sup> Mark S. Levenson, Ph.D., "All-Terrain Vehicle 2001 Injury and Exposure Studies," U.S. Consumer Product Safety Commission, January 2003, pp. 9, 24.

<sup>25</sup> George Szappanos, "Does Size Really Matter?" August 2003, Sportquad.com, <http://www.off-road.com/atv/kidskorner/youthupgrade.htm>; "Stage 1 - Air Intake Upgrade", Sportquad.com, September 2003, <http://www.off-road.com/atv/kidskorner/youthatvupgrade2.html> ; "Stage2-Exhaust Upgrade," October 2003, <http://www.off-road.com/atv/kidskorner/youthatvupgrade3.html>.

<sup>26</sup>Szappanos, op.cit., October 2003.



foreign exporter has a detailed buyer safety agreement checklist that is signed by the buyer at time of purchase.<sup>27</sup>

Distributors who do not have dealerships, but who sell directly over the Internet, appear to generally provide information about the age guidelines on their Web sites. Whether, how, and to what extent these guidelines are implemented at the time of Internet purchase is not known.

Distributors who have entered into the Voluntary Action Plans conduct random undercover monitoring of their dealerships. CPSC staff also conducts undercover monitoring. Dealers who violate the age recommendations agreement are subject to follow-up inspections, additional training, and possible termination of their franchise agreements.

#### Information Available on Product and at Point of Purchase

As a part of the Voluntary Action Plans, ATV manufacturers continue to use warning labels on all new vehicles. These include general warning labels, labels specifically warning against the use of ATVs by children under the recommended ages, labels warning against the operation of the vehicle with a passenger, and hang tags containing safety information including the age recommendations. The hang tags are displayed on each new vehicle, and the consumer must physically remove them. The owner's manuals that come with the ATV also contain safety information, including warnings against the use of ATVs by children under the age of 16. A safety alert and a safety video also are provided to each purchaser at the point-of-purchase; these are updated regularly and contain information about the age recommendations.<sup>28</sup>

#### ATV Safety Institute Training Course

The ATV Safety Institute (ASI) offers free hands-on training to new ATV purchasers through participating manufacturers. Within 48 hours after purchase, the new owner and his or her family are contacted by the industry to encourage them to enroll in a free rider course. Courses are available at nearly 1,000 locations in the U.S., and mileage expenses are paid for by the industry if the teaching site is farther than 50 miles. Children under 16 years of age can take the course only if they are on an appropriate-age vehicle; special teaching arrangements are made for children under 16 and parents are encouraged to attend. Parents of children younger than 12 who are taking the course must attend the entire course with their child. The new purchaser's name remains on the contact list for training and is removed only when the buyer completes or refuses to take the course.<sup>29</sup>

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<sup>27</sup> Dinli LP, "Dinli Buyer Safety Agreement Checklist", <http://www.dinliusa.com/safetytips.html>.

<sup>28</sup> "Before the United States Consumer Product Safety Commission: Joint Comments of American Honda Motor Co., Inc., American Suzuki Motor Corporation, Arctic Cat Inc., Bombardier Motor Corporation of America, Kawasaki Motors Corp., U.S.A., Polaris Industries Inc., and Yamaha Motor Corporation, U.S.A.," March 17, 2003, p. 4.

<sup>29</sup> Elisabeth Piper, Director, Corporate Affairs, Specialty Vehicle Institute of America, Testimony for West Virginia hearing before Consumer Product Safety Commission re: Petition Number CP-02-4/HP-02-1 and Tom Yager, Vice President, Safety Programs, ATV Safety Institute, "Testimony for West Virginia Hearing Before Consumer Product Safety Commission Re: Petition Number: CP-02-4/HP-02-1

***Summary***

The ATV market continues to grow, with historically high volumes of sales and increasing numbers of firms. The major manufacturers continue to hold most of the market share of retail sales, but new firms are gaining a foothold in the market, primarily through the sale of youth ATVs. Sales of new ATVs continue to occur through the traditional route of dealerships, but some sales now are occurring over the Internet. Safety information, particularly about the age recommendations, is disseminated to consumers in a variety of ways.

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UNITED STATES  
CONSUMER PRODUCT SAFETY COMMISSION  
WASHINGTON, DC 20207

**Memorandum**

Date: July 12, 2004

TO : Elizabeth W. Leland, Project Manager Petition HP-02-1  
Directorate for Economic Analysis

THROUGH: Susan Ahmed, Ph.D., Associate Executive Director  
Directorate for Epidemiology

*RR for SA*

Russell Roegner, Ph.D., Director  
Division of Hazard Analysis

*RR*

FROM : Mark S. Levenson, Ph.D. *ML*  
Division of Hazard Analysis

SUBJECT : ATV Risk Estimates for Youths

**Introduction**

The U.S. Consumer Product Safety Commission (CPSC) docketed a petition requesting the ban of the sale of adult-sized, four-wheel, all-terrain vehicles (ATVs) for children under the age of 16 (CP-02-4/HP-02-1). Adult-sized ATVs have been defined as ATVs with engine sizes greater than 90 cc. In order to quantify the size and severity of the youth ATV hazard, this memo provides ATV injury, exposure, and risk estimates for ATV riders under the age of 16. For perspective, the memo gives estimates for other age groups, but the focus of the discussion is on the under-16 age group. For the purpose of this memo, riders under the age of 16 will be referred to as *youth riders*.

The memo is organized as follows. First, the ATV injuries are classified by the age of the ATV driver, the age of the injured person, and the riding position of the injured person. Second, the severity of the ATV injuries is compared to consumer products as a whole. Third, estimates of injuries are compared to estimates of exposure to derive risk measures for ATVs. The risk measures are disaggregated by the age of the injured person, the age of the ATV driver, and the ATV engine size. Finally, a long-term comparison of ATV risk is given.

## Methodology

In 1997 and 2001, CPSC staff and ATV industry members conducted studies of ATV injuries and exposure. The details and results of the studies are documented in the report *All-Terrain Vehicle 2001 Injury and Exposure Studies* ("2001 Studies Report") [Levenson 2003]. The "2001 Studies Report" contains injury, exposure, and risk estimates for the U.S. as a whole and for various subgroups for the years 1997 and 2001. The report considers various age subgroups, but is not focused on youth riders. This current memo highlights and extends the results from the "2001 Studies Report" for youth riders. Refer to the "2001 Studies Report" for the background on the injury and exposure studies, and the methodology used to analyze the studies. A brief review is given here and differences with the current methodology are noted.

There are four relevant studies: the 1997 and 2001 CPSC-staff injury studies and the 1997 and 2001 industry-sponsored exposure studies. The injury studies collected information to measure the size and characteristics of the injured population in the U.S. The information includes details on the injury incident, such as usage at the time of the incident and the characteristics of the ATV involved in the incident, and general information on the driver of the ATV, such as driver experience. The exposure studies collected information on the overall ATV vehicle, driver, and passenger populations in the U.S. to measure the sizes and characteristics of these populations.

There are five basic exposure measures used in this report. The exposure measures emphasize different aspects of exposure. To present these measures, it is necessary to distinguish between drivers and passengers. *ATV riders* are made up of *drivers* and *passengers*. A *driver* is a rider who operated an ATV at least once in the year prior to the study. A driver may also ride at times as a non-operator. A *passenger* is a rider who has not operated an ATV in the year prior to the study. The measure *Driving Hours* refers to the amount of time ATVs are driven. The measure *Riding Hours* is made up of driving hours multiplied by the number of riders exposed. For example, if an ATV is driven for one hour with a driver and a passenger, then the contribution to driving hours is one hour and the contribution to riding hours is two hours.

The five basic exposure measures used are the number of ATV drivers, the number of ATV riders, the annual driving hours, the annual riding hours, and the number of ATVs. Drivers and riders include all those riders in the U.S. who rode an ATV in the year prior to the exposure survey. Driving and riding hours include the total numbers of driving and riding hours in the U.S. in the year prior to the exposure survey. Because of the difficulty of obtaining reliable separate estimates of non-occupational and occupational driving and riding hours, these measures include both non-occupational and occupational use. The number of ATVs includes only those that are owned by households and are in operating order.

Five risk measures are defined as the rate of injury per each of the exposure measures. The five measures are *injuries per driver*, *injuries per rider*, *injuries per driving hour*, *injuries per riding hour*, and *injuries per ATV*. Because of the magnitudes of the measures, they are expressed in the tables as *injuries per thousand drivers*, *injuries per thousand riders*, *injuries per million driving hours*, *injuries per million riding hours*, and *injuries per thousand ATVs*.

In the "2001 Studies Report", the *injuries per rider* and *injuries per riding hour* measures excluded injuries to *non-riders*. Non-riders include bystanders and others who were not riding an ATV at the time of the injury. The exclusion of these injuries was done because there are no comparable exposure measures for non-riders. The non-rider injuries were not excluded from the *injuries per*

*driver, injuries per million driving hours, and injuries per thousand ATVs* measures, because all ATV injuries are associated with some ATV driver and ATV. In the present memo, non-rider injuries are included in the *injuries per rider* and *injuries per riding hour* measures. Non-rider injuries make up only an estimated 1% and 2% of all the injuries in 1997 and 2001, respectively. The inclusion of these injuries does not markedly affect the measures and makes the number of injuries consistent across the analyses.

Since the publication of the "2001 Studies Report", the annual estimates of the number of ATV injuries have been revised. The revision was based on a detailed review of the 1997 and 2001 injury study cases. The revised estimates and information on the revision are given in the ATV annual report [Ingle 2003]. This memo uses the revised estimates, and therefore, the injury estimates differ slightly from those of the "2001 Studies Report".

## Results

### *Injuries by Driver Age, Injured Age, and Injured Position*

In an ATV injury incident, the person injured may be the ATV driver, a passenger, or some non-rider. Table 1 gives the estimated number of injuries by the age of the driver, the age of the injured person, and the riding position of the injured person in 2001. The riding position of the injured person is broken down into two categories: *Driver* and *Passenger/Other*. Passengers and non-riders make up the *Passengers/Other* categories. In 2001, 4% of the injured youths were non-riders, and 1% of the injured age 16 and over were non-riders.

In 2001, there were an estimated 21,500 injuries to youth drivers. Overall, youth drivers were involved in 28,900 injury incidents. Among these 28,900 injuries, an estimated 27,800 injuries were to youths. There were an estimated 6,600 injuries to youths in which the driver was age 16 and over.

Table 1: Estimated Injuries by Driver Age, Injured Age, and Injured Position in 2001.

Injured Age	Injured Position	Driver Age		
		< 16	≥16	Total
< 16	Driver	21,500	0	21,500
	Passenger/Other	6,300	6,600	12,900
	<b>Total</b>	<b>27,800</b>	<b>6,600</b>	<b>34,400</b>
≥16	Driver	0	69,200	69,200
	Passenger/Other	1,000	5,500	6,600
	<b>Total</b>	<b>1,000</b>	<b>74,700</b>	<b>75,700</b>
<b>Total</b>	Driver	21,500	69,200	90,700
	Passenger/Other	7,300	12,100	19,500
	<b>Total</b>	<b>28,900</b>	<b>81,300</b>	<b>110,100</b>

Notes: Numbers rounded. Injury estimates include only injuries involving a hospital emergency room visit.

***Injury Severity***

Table 2 gives the distribution of the disposition of the injuries by the age of the injured person for all consumer products and for ATVs in 2001. These results are expressed as percentages, because of the large size of the all-product counts. A notably greater percentage of ATV injuries resulted in hospitalization (an estimated 9%) than for all products (an estimated 4%). The situation was more extreme for youth injuries, where the hospitalization rate for ATV injuries was 9% compared to 2% for all products.

Table 2: Disposition Estimates for All Products and ATVs by Injured Age for 2001.

		Injured Age		
		0 to 15	≥16	Overall
<b>All Products</b>	<b>Treated/Released</b>	97%	94%	95%
	<b>Treated/Transferred</b>	1%	1%	1%
	<b>Hospitalized</b>	2%	5%	4%
	<b>Other</b>	0%	0%	0%
	<b>Total</b>	100%	100%	100%
<b>ATVs</b>	<b>Treated/Released</b>	89%	87%	88%
	<b>Treated/Transferred</b>	2%	3%	3%
	<b>Hospitalized</b>	9%	9%	9%
	<b>Other</b>	0%	1%	1%
	<b>Total</b>	100%	100%	100%

Notes: Injuries include only injuries involving a hospital emergency room visit.



**U.S. Total Risk**

For summary, Table 3 gives the injury, exposure, and risk estimates in 1997 and 2001 for the U.S. As noted above, the injury numbers differ slightly from those of the “2001 Studies Report.”

From 1997 to 2001, the estimated number of ATV-related injuries rose from 52,800 to 110,100, representing an increase of 109%. The largest increase among the exposure measures was for driving hours, which increased by an estimated 50%. The fact that driving hours increased faster than the number of drivers indicates that drivers on the average drove more hours in 2001 than in 1997. The same pattern exists for riders and riding hours. Likewise, the exposure measures indicate that ATVs were on the average driven more hours in 2001 than in 1997.

Injuries have increased at a greater rate than any of the five exposure measures. This disparity between the increase in injuries and exposure is reflected in the risk measures, which show that risk increased anywhere from an estimated 39% to 65% depending on the risk measure.

Table 3: U.S. ATV Injury, Exposure, and Risk Estimates.

	Year		% Increase
	1997	2001	
<b>Injuries</b>	52,800	110,100	109%
<b>Exposure Measures</b>			
Drivers (Million)	12.0	16.3	36%
Riders (Million)	18.1	22.9	26%
Driving Hours (Million)	1,580	2,360	50%
Riding Hours (Million)	1,800	2,610	45%
ATVs (Million)	4.0	5.6	40%
<b>Risk Measures</b>			
Injuries / Thousand Drivers	4.4	6.7	54%
Injuries / Thousand Riders	2.9	4.8	65%
Injuries / Million Driving Hours	34	47	39%
Injuries / Million Riding Hours	29	42	44%
Injuries / Thousand ATVs	13	20	50%

Notes: Numbers rounded. Percentages are based on unrounded numbers. Injury estimates include only injuries involving a hospital emergency room visit.

**Rider Age**

Table 4 gives the injury, exposure, and risk estimates in 1997 and 2001 for the under-16 age group and the 16 and over age group.

Both rider age groups experienced a large increase in injuries between 1997 and 2001. The risk as measured by *Injuries / Thousand Riders* was similar to each other for the two rider-age-groups in 2001. However, the risk for youth riders as measured by *Injuries / Million Riding Hours* was larger than for the riders age 16 and over in 2001. Overall, both age groups experienced an increase in the risk measures between 1997 and 2001, with the riders age 16 and over experiencing the larger increases.

Table 4: U.S. ATV Injury, Exposure, and Risk Estimates by Rider Age

		Rider Age (Years)	
		0 to 15	≥16
<b>Injuries</b>	<b>1997</b>	20,800	31,900
	<b>2001</b>	34,400	75,700
	<b>% Increase</b>	60%	136%
<b>Exposure Measures</b>			
Riders (Million)	<b>1997</b>	6.6	11.5
	<b>2001</b>	7.2	15.7
	<b>% Increase</b>	9%	36%
Riding Hours (Million)	<b>1997</b>	430	1,370
	<b>2001</b>	570	2,030
	<b>% Increase</b>	34%	48%
<b>Risk Measures</b>			
Injuries / Thousand Riders	<b>1997</b>	3.2	2.8
	<b>2001</b>	4.8	4.8
	<b>% Increase</b>	51%	74%
Injuries / Million Riding Hours	<b>1997</b>	49	23
	<b>2001</b>	60	37
	<b>% Increase</b>	23%	60%

Notes: Numbers rounded. Percentages are based on unrounded numbers. Injury estimates include only injuries involving a hospital emergency room visit.

### *Driver Age*

A comparison among age groups based on the age of the rider masks the effect of being a driver versus a passenger. In 2001, an estimated 60% of the youth riders were passengers as compared to an estimated 14% for riders age 16 and over. Comparison based on the age of the ATV driver removes this effect. However, for injuries, the driver may not be the person injured. For example, an injury to a 12-year-old passenger on an ATV driven by an 18-year-old driver would be classified under the age group that contains the age 18.

Table 5 gives the injury, exposure, and risk estimates in 1997 and 2001 for five age groups of ATV drivers. A finer breakdown of age groups is used here to highlight differences within the under-16 and 16-and-over age groups. The 12 to 15 driver age group experienced a large increase in injuries between 1997 and 2001 and did not experience much of any increase in exposure by either exposure measure. Correspondingly, the risk for the 12 to 15 age group had a large increase between the two years. In contrast, the risk for the 0 to 11 age group decreased between the two years. Each of the over 16 driver age groups experienced large increases in injuries and risk between the two years. In 2001, the risks for the 12 to 15 and the 16 to 24 age groups were the largest among the age groups.

Table 5: U.S. ATV Injury, Exposure, and Risk Estimates by Age of ATV Driver.

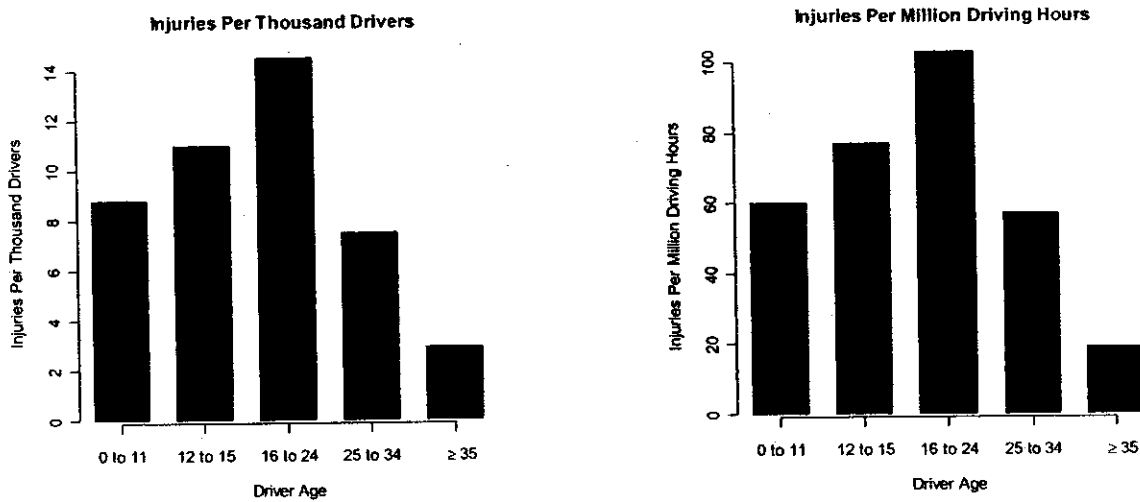
		Driver Age (Years)				
		0 to 11	12 to 15	16 to 24	25 to 34	≥35
<b>Injuries*</b>	<b>1997</b>	7,700	10,400	16,800	10,000	7,800
	<b>2001</b>	9,600	19,200	37,000	20,800	23,500
	<b>% Increase</b>	25%	85%	119%	108%	201%
<b>Exposure Measures</b>						
Driver (Million)	<b>1997</b>	0.7	1.8	1.7	2.4	5.4
	<b>2001</b>	1.1	1.8	2.6	2.8	8.1
	<b>% Increase</b>	48%	-2%	51%	17%	49%
Driving Hours (Million)	<b>1997</b>	110	230	220	290	720
	<b>2001</b>	160	250	360	360	1,230
	<b>% Increase</b>	43%	8%	66%	26%	70%
<b>Risk Measures</b>						
Injuries / Thousand Drivers	<b>1997</b>	10.4	5.8	10.0	4.2	1.4
	<b>2001</b>	8.8	11.0	14.5	7.5	2.9
	<b>% Increase</b>	-15%	88%	45%	78%	101%
Injuries / Million Driving Hours	<b>1997</b>	68	45	78	35	11
	<b>2001</b>	60	77	103	57	19
	<b>% Increase</b>	-13%	71%	33%	65%	77%

\*Injuries are classified by the age of the ATV driver, who may not be the person injured.

Notes: Numbers rounded. Percentages are based on unrounded numbers. Injury estimates include only injuries involving a hospital emergency room visit.

Figure 1 displays the two risk measures for the five driver-age-groups in 2001 as a supplement to Table 5. As seen in the figure, the three youngest driver-age-groups, 0 to 11, 12 to 15, and 16 to 24, each had higher risk as measured by either *injuries per thousand drivers* or *injuries per million driving hours* than the two oldest age groups, 25 to 34 and  $\geq 35$ . Also, although the two risk measures have different units, both risk measures have a similar pattern across the age groups.

Figure 1: U.S. ATV Risk Estimates by Age of ATV Driver for 2001.\*



\*Injuries are classified by the age of the ATV driver, who may not be the person injured. Injury estimates include only injuries involving a hospital emergency room visit.

### ***Engine Size and Youth Drivers***

Based on the 1997 and 2001 ATV exposure studies, it is not possible to associate ATV characteristics, such as engine size, with all ATV drivers. It is only possible to do this association for drivers in households that own ATVs. A driver in such a household was asked if the ATV owned by the household was the ATV that the driver rode most frequently during the past year. For drivers who answered yes to the question, characteristics of the household ATV, such as engine size, could be associated with the driver. It is, however, possible from the injury studies to associate ATV characteristics with drivers for all injuries.

Because of the large amount of incomplete responses on engine size from the studies, the results for this analysis are expressed in percentage terms only. For information on this issue see the "2001 Studies Report." Note that there was a minor error in the analysis for "2001 Studies Report" in the association of ATVs with drivers resulting in small numerical differences with the present results.

Table 6 gives the estimated percent of injuries involving youth drivers by the ATV engine size in the year 2001. The percents are given for ATV-owning households and all households. For owning households, similar percentages are given for the number of drivers and the number of driving hours.

The vast majority of youth drivers involved in an injury incident were driving adult-sized ATVs. For owning households, an estimated 87% of youth drivers involved in an injury incident were on adult-sized ATVs. Likewise, for all-households, an estimated 89% of youth drivers involved in an injury incident were on adult-sized ATVs. The characteristics of the general youth driver population were not as extreme. For owning households, an estimated 75% of the youth drivers drove adult-sized ATVs and, an estimated 73% of the driving hours for the youth drivers were on adult-sized ATVs. The disparities between the injury and exposure estimates imply that the risk of injury for youth drivers was larger with adult-sized ATVs than non-adult-sized ATVs.

Table 6: U.S. ATV Injury and Exposure Percent Estimates by Engine Size For Youth Drivers In 2001.

	Engine Size (cc)	Owning Households	All Households
<b>Injuries*</b>	0 to 90	13%	11%
	>90	87%	89%
	<b>Total</b>	<b>100%</b>	<b>100%</b>
<b>Exposure Measures</b>			
Drivers (Million)	0 to 90	25%	
	>90	75%	
	<b>Total</b>	<b>100%</b>	
Driving Hours (Million)	0 to 90	27%	
	>90	73%	
	<b>Total</b>	<b>100%</b>	

\*Injuries are classified by the age of the ATV driver, who may not be the person injured.

Notes: Numbers rounded. Percentages are based on unrounded numbers. Injury estimates include only injuries involving a hospital emergency room visit. There was a minor error in the analysis for "2001 Studies Report" in the association of ATVs with drivers resulting in small numerical differences with the present results.

### **Long-Term Comparison**

Comparing ATV risks over an extended period of time is difficult because of changes in data sources. Table 7 attempts to compare the risk of injury per ATV for the years 1985, 1989, 1997, and 2001. The years 1985 and 1989 represent the years before and in the beginning of the consent decrees with ATV manufacturers. The years 1997 and 2001 represent the years at the end of and after the consent decrees.

Injury estimates come from the ATV annual report [Ingle 2003], which adjusts for changes in the injury data source (NEISS). Estimates of ATVs in 1985 and 1989 were derived from ATV shipment estimates and models for the operability life of ATVs [Scheers et al 1991]. Estimates of the number of ATVs in 1997 and 2001 came from the 1997 and 2001 exposure studies.

The estimated number of injuries in 2001 was close to the number in 1985. However, this is offset by the larger number of ATVs in 2001 as compared to 1985. The risk in 2001 was close to the risk in 1989. The largest decrease in risk occurred between 1985 and 1989 and was associated with the change in the ATV market from three-wheel models to four-wheel models [Scheers et al 1991]. There was a large increase in risk between 1997 and 2001.

Table 7: Long-Term Comparison of ATV Risk Estimates.

	Year			
	1985	1989	1997	2001
<b>Injuries</b>	105,700	70,300	52,800	110,100
<b>ATVs (Million)</b>	1.9	2.8	4.0	5.6
<b>Injuries Per Thousand ATVs</b>	54	25	13	20

Notes: Estimates are rounded. Injury estimates from Ingle [2003]. 1985 and 1989 ATV estimates from Scheers et al [1991] and are based on sales figures and operability models. 1997 and 2001 ATV estimates from Levenson [2003] and are based on exposure studies. Injury estimates include only injuries involving a hospital emergency room visit.



## Summary

A comparison of risk among drivers in five age groups showed that the *12 to 15* and *16 to 24* age groups have the highest risk of being involved in an injury incident in 2001.

The vast majority of youth drivers (drivers under the age of 16) who were involved in an injury incident were driving adult-sized ATVs in 2001. The unadjusted risk of being involved in an injury incident for youth drivers was higher on adult-sized ATVs than on non-adult-sized ATVs. Other factors, observed and unobserved, might explain some of this difference in risk. For example, a difference in parental supervision between those youths riding non-adult-sized ATVs and those riding adult-sized ATVs could explain some of difference in risk, if such a difference in supervision existed.

Both youth and non-youth ATV injuries resulted in higher hospitalization rates than injuries from all consumer products in 2001.

The risk for all ages, as measured by injury per ATV, was lower in 2001 than in 1985. However, the risk increased from 1997 to 2001 and in 2001 was close to the risk in 1989.

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# 2003 Annual Report of ATV Deaths and Injuries

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January 2005

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## **Introduction**

U.S. Consumer Product Safety Commission (CPSC) staff first began analyzing data on all-terrain 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 <sup>1</sup>	Number of Deaths	Difference Since Last Update (12/31/2002)
<b>Total</b>	<b>5,791</b>	<b>+552</b>
<i>2003</i>	<i>407</i>	<i>+407</i>
<i>2002</i>	<i>473</i>	<i>+116</i>
<i>2001</i>	<i>494</i>	<i>+27</i>
<i>2000</i>	<i>448</i>	<i>+2</i>
<i>1999</i> <sup>2</sup>	<i>399</i>	<i>0</i>
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.

<sup>1</sup> Reporting is incomplete for 2000-2003.

<sup>2</sup> 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**

<b>State</b>	<b>Reported Deaths 1982-1999</b>	<b>Cumulative Percent of U.S. 1982-1999</b>	<b>Reported Deaths 2000-2003*</b>	<b>Total Reported Deaths*</b>
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**

<b>Year<sup>3</sup></b>	<b>0-15 Years Old</b>	<b>0- 15 Years Old Percent of Total</b>
<b>Total</b>	<b>1,846</b>	<b>32%</b>
<i>2003</i>	<i>111</i>	<i>27</i>
<i>2002</i>	<i>121</i>	<i>26</i>
<i>2001</i>	<i>128</i>	<i>26</i>
<i>2000</i>	<i>124</i>	<i>28</i>
<i>1999<sup>4</sup></i>	<i>90</i>	<i>23</i>
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.)

<sup>3</sup> 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.

<sup>4</sup> 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 <sup>5</sup>	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) <sup>6</sup>	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 <sup>7</sup>	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

<sup>5</sup> Reporting is incomplete for 2000-2002.

<sup>6</sup> Rounded.

<sup>7</sup> 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.<sup>8</sup>

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.

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<sup>8</sup> Levenson, M. *All-Terrain Vehicle 2001 Injury and Exposure Studies*. U.S. Consumer Product Safety Commission. January 2003.

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

<b>Year</b>	<b>Estimated Number of Injuries All Ages</b>	<b>Estimated Number of Injuries Ages Less Than 16 Years</b>	<b>Percent of Total Ages Less Than 16 Years</b>
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	<sup>10</sup>	
1983	32,100	<sup>10</sup>	
1982	10,100	<sup>10</sup>	

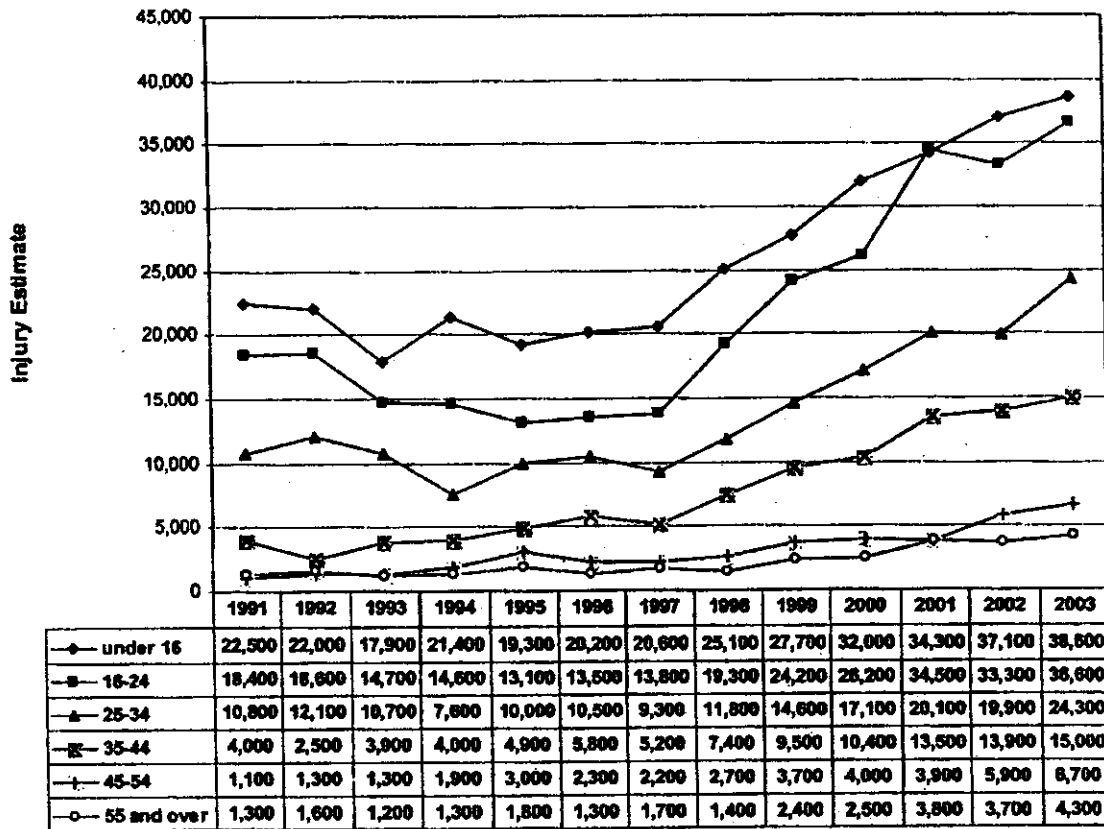
Source: National Electronic Injury Surveillance System, U.S. Consumer Product Safety Commission.

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

<sup>9</sup> Estimates have been adjusted according to the methodology in Appendix B.

<sup>10</sup> Adjusted estimates for children under 16 years old were not computed prior to 1985.

**Figure 1**  
**Annual ATV-Related Injury Estimates<sup>11</sup>**  
**ATVs with 3, 4 or Unknown Number of Wheels**  
**1991-2003**



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.

<sup>11</sup> 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 <sup>12</sup>	Estimated 4-Wheel ATVs in Use (millions) <sup>13</sup>	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

<sup>12</sup> Annual estimates have been adjusted according to the methodology in Appendix B.

<sup>13</sup> 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**

<b>Year<sup>14</sup></b>	<b>0-11 Years Old</b>	<b>0-11 Years Old Percent of Total</b>	<b>0-15 Years Old</b>	<b>0- 15 Years Old Percent of Total</b>
<b>Total</b>	<b>778</b>	<b>13%</b>	<b>1,846</b>	<b>32%</b>
<i>2003</i>	<i>50</i>	<i>12</i>	<i>111</i>	<i>27</i>
<i>2002</i>	<i>41</i>	<i>9</i>	<i>121</i>	<i>26</i>
<i>2001</i>	<i>56</i>	<i>11</i>	<i>128</i>	<i>26</i>
<i>2000</i>	<i>50</i>	<i>11</i>	<i>124</i>	<i>28</i>
1999 <sup>15</sup>	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.

<sup>14</sup> 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.

<sup>15</sup> 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

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

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:

$$estimate = \frac{(M_{NP} + 1)(N_{NP} + 1)}{n_{NP} + 1} - 1 + C_p \quad \text{Formula 2}$$

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

$$Estimate_{4W} = \frac{rep_{4W}}{rep_{3W+4W}} Est_{3W+4W+UW} \quad \text{Formula 3}$$

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.<sup>16</sup> 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.<sup>17</sup> Estimates have been adjusted due to revisions in the NEISS Coding Manual in 1985, as well as to account for NEISS sampling frame updates.<sup>18</sup> 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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<sup>16</sup> 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.

<sup>17</sup> 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.

<sup>18</sup> 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.<sup>19</sup> 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:

$$Total\ Estimate_{4W} = \frac{Estimate_{4W}}{Estimate_{3W+4W}} (Estimate_{3W+4W+UW}) \quad Formula\ 4$$

where

*Total Estimate<sub>4W</sub>* is the total estimated injuries associated with four-wheel ATVs with unknowns apportioned,

*Estimate<sub>4W</sub>* is the estimated injuries associated with four-wheel ATVs not including unknowns,

*Estimate<sub>3W+4W</sub>* is the combined estimated injuries associated with three- and four-wheel ATVs (not including unknowns),

*Estimate<sub>3W+4W+UW</sub>* 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.

<sup>19</sup> Levenson, M., *ATV Injury Adjustment Factors for 1997 and 2001*, memorandum. September 12, 2003. U.S. Consumer Product Safety Commission.

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