PART III
Report on AU-Terrain Vehicle-Related Deaths
January 1, 1985 - December 31, 1996

April 1998

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Introduction

The U.S. Consumer Product Safety Commission (CPSC) began collecting All-Terrain Vehicle (ATV)-related death data in the mid-1980's, when the number of deaths was rising sharply. After April 1988, when consent decrees between the CPSC and the ATV distributors became effective, CPSC began publishing quarterly reports of injuries and deaths from ATV-related incidents. This report summarizes the details of the ATV-related deaths CPSC has compiled from January 1, 1985 through December 31, 1996.

Methodology

CPSC collects reports of ATV-related incidents resulting in death from a variety of sources. These include news clips, consumer complaints, medical examiner and coroner (MECAP) reports, and death certificates. The data upon which the quarterly reports are based have been carefully screened for duplicate and out-of-scope incidents and are maintained in a special data base designated for ATV-related death reports. Once a relevant case has been identified, it is assigned for an in-depth investigation by CPSC field staff. Field investigators contact the most knowledgeable person regarding the incident, generally the next of kin. Where states do not permit contact with next of kin, detailed information, including police reports and photos, is sought from the investigating law official. Other supporting documents are obtained from the coroner's office. These investigations provide more detail about the nature of the incidents and persons involved, including specific characteristics about the ATV involved.

Because CPSC does not receive 100 percent reporting on ATV-related incidents, a statistical estimating procedure, capture-recapture, is used to obtain a reasonably representative estimate of the number of ATV-related deaths that occur nationally. This procedure involves the use of data from two separate files in the data base:

(1) the Injury, Potential Injury Incident (IPII) file, which is primarily composed of news clips, paid and voluntary MECAP reports, consumer complaints, referrals, and data from other sources, and

(2) the Death Certificate (DCRT) file, which contains product-related death certificates from states and jurisdictions across the country.

The procedure for estimating ATV-related deaths has two parts. For public road fatalities, the count is the number of reports received. For fatalities occurring on terrain other than public roads, the capture-recapture estimating method is used by matching and determining the overlap between the two files (IPII) and (DCRT). The two parts are then combined to determine the estimate.

RESULTS

How MANY PEOPLE ARE DYING ON ATVs AND WHO IS DYING?

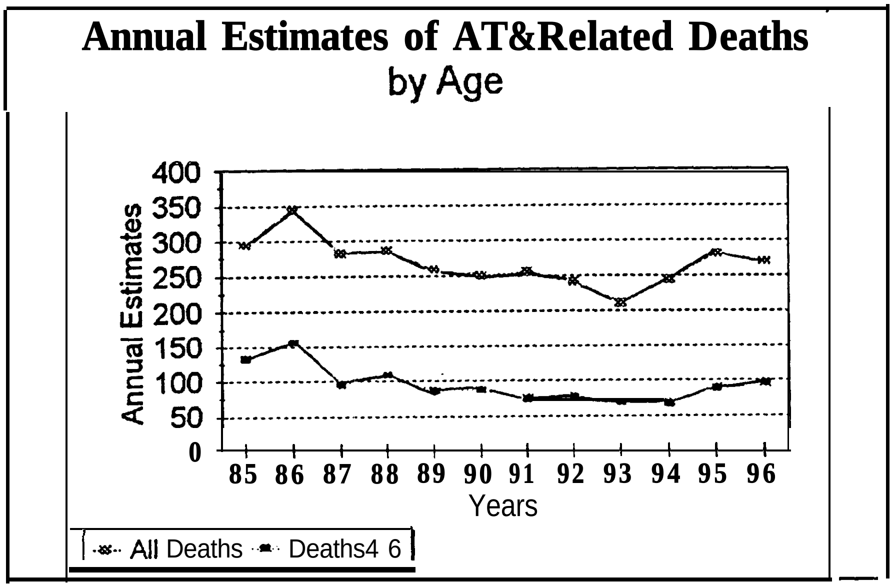
Based on 2,798 ATV related death reports received over the 12-year period January 1, 1985 through December 31, 1996 CPSC estimates that over 3,200 ATV-related deaths occurred. Table 1 below shows the number of ATV-related deaths by year of occurrence. The table shows both the reported and the estimated numbers. Figure 1 shows the annual estimated number of deaths overall and for children under age 16.

Table 1
Annual Estimated and Reported Number of
AN- Related Deaths

YEAR	REPORTED NUMBER OF DEATHS	ESTIMATED[1] NUMBER OF DEATHS
1996	242	269
1995	196	281
1994	198	**244**
1993	183	211
1992	221	241
1991	230	255
1990	234	250
1989	230	258
1988	250	286
1987	264	282
1986	299	347
1985	251	295
TOTALS	2,798	**3,219**

Source: U. S. Consumer Product Safety Commission (CPSC), Directorate for Epidemiology and Health Sciences (EH), Division of Hazard Analysis (EHHA), January 1, 1985- December 31, 1996.

Figure 1



What is the Rate of Death Associated With The Use of Four-Wheel All-Terrain Vehicles ?

The rate of death associated with 4-wheel ATVs is shown to have decreased over the time period January 1, 1985 through December 31, 1996. The rate of death is based on calculations per 10,000 vehicles in use (based on sales and exposure data provided by industry).

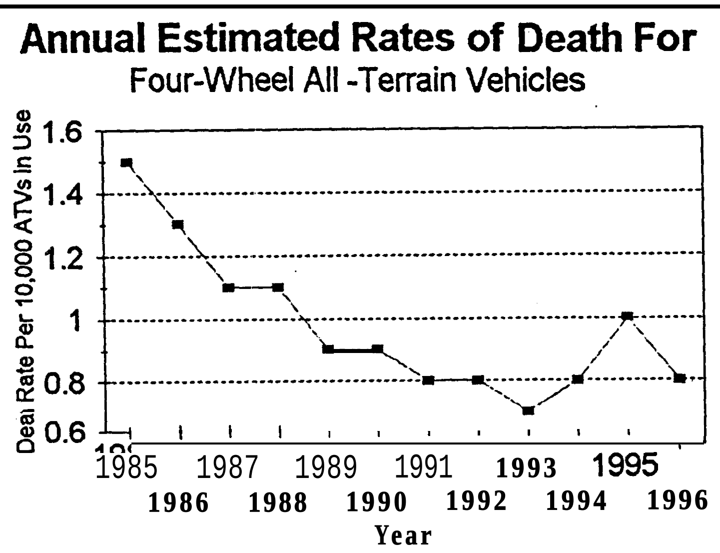
Figure 2 illustrates the decrease in the rate of death associated with four-wheel ATVs during this period. The rate of death was shown to have decreased from a high of 1.5 deaths per 10,000 ATVs in 1985 to a low of 0.7 in 1993. A trend test, using the Spearman rank correlation coefficient was conducted to evaluate the change in the rate of death over this 12-year period.

There was a statistically significant downward trend ($p=0.019$). However, the downward trend occurred mostly during the 1985-1991 period, after which the data show no evidence of trend behavior.

No trend analysis for the rate of death was performed for three-wheel ATVs because of limited or unavailable exposure data. However, reliable exposure data for three-wheel ATVs are available for three years during the 1985, 1986 and 1997 time period. CPSC conducted exposure studies in 1985, 1986 and 1997.

Based on these three years of exposure data and the number of deaths from 1985, 1986 and 1996, the death rate for three-wheel ATVs dropped from 1.5 per 10,000 ATVs in use in 1985 to 0.7 in 1989 and 1996. It should be noted that the 1996 rate estimate was calculated from the estimated number of three-wheel ATVs in use in 1997. Any error in the 1996 estimate would tend to overestimate the rate to the extent that there are fewer three-wheel ATVs in 1997 than in 1996.

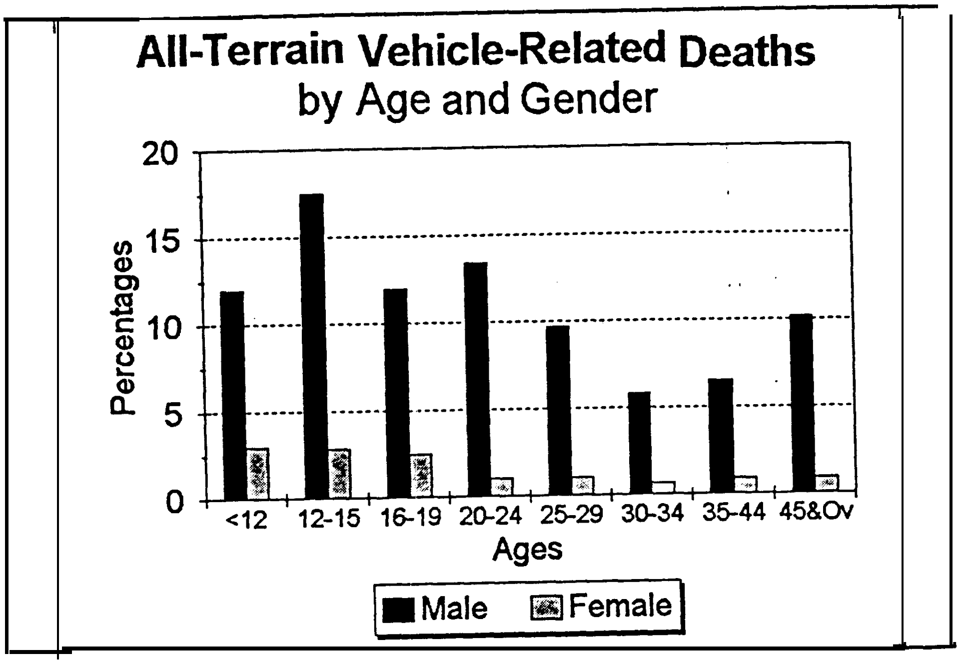
FIGURE 2



WHAT ARE THE CHARACTERISTICS OF THE VICTIMS ?

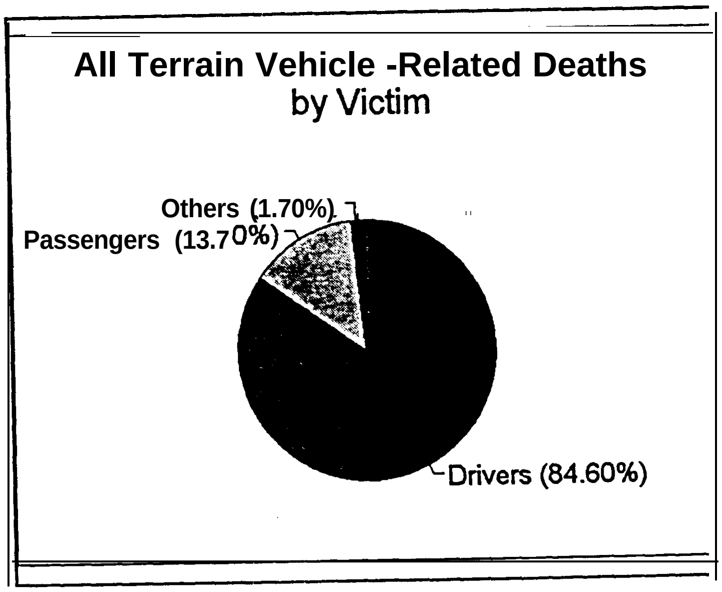
Figure 3 presents the percentage of ATV-deaths by age and gender. The greatest number of deaths occurred to males. Deaths to males accounted for 87 percent of the total estimated 3,200 deaths and were nearly seven times that of female deaths, which were 13 percent of the estimated total. The group most affected was young males between the ages of 12 and 19 years, who accounted for 30 percent of all deaths. Within this group, males between the ages of 13 and 15 proportionately suffered more deaths (about 18 percent of all deaths) than males of other ages.

FIGURE 3



More than 80 percent of the victims in these ATV incidents were drivers of the ATV involved (Figure 4). Passengers accounted for about 14 percent of the deaths, most of whom were ATV passengers. Passengers of other vehicles were less than one tenth of one percent of this group.

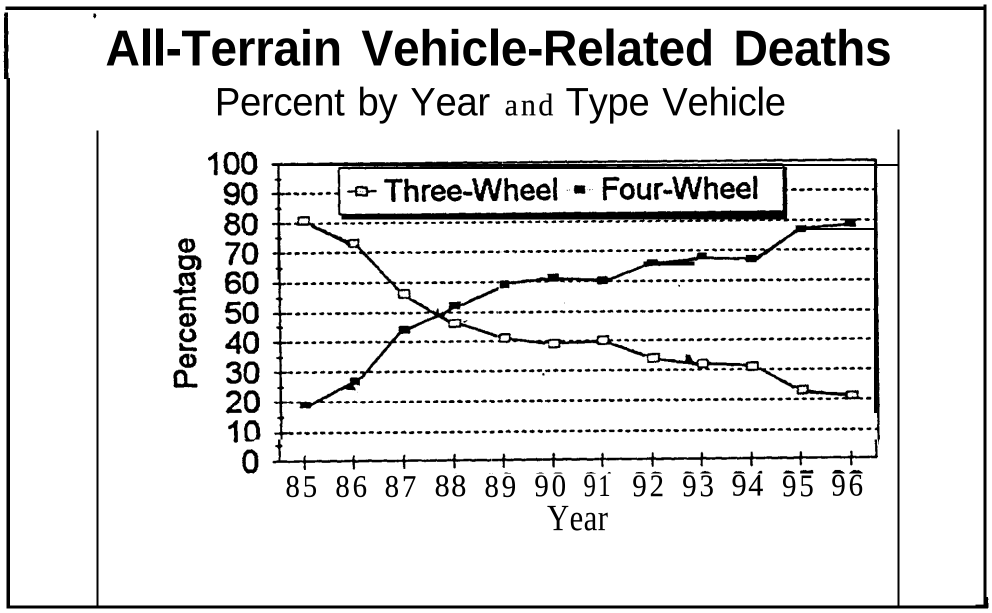
FIGURE 4



WHAT ARE THE CHARACTERISTICS OF VEHICLES INVOLVED IN DEATHS?

Fifty-four percent of the vehicles involved in ATV deaths over the twelve year period between 1985 and 1996 were four-wheel ATVs. For the last two years in this period, 1995 and 1996, four wheel ATVs were involved in about 80 percent of the deaths. This is not a surprising finding since the 1988 Consent Decrees contained a provision prohibiting the manufacture and sale of three-wheel ATVs. Forty-four percent of the vehicles involved in deaths during this twelve-year period were three-wheel ATVs, and two percent were ATVs with an unspecified number of wheels. The percentage of three-wheel ATVs involved in deaths declined from about 80 percent in 1985 to slightly less than 20 percent in 1996 (see figure 5).

Figure 5



About 83% of all ATVs involved in deaths had engine sizes of 200cc or greater. About half (48 percent) of all vehicles had engines 250cc or greater. ATVs with engine sizes greater than 250cc involved in deaths increased from about two percent of the total vehicles involved in deaths in 1985 to about 51 percent of those involved in deaths in 1996. ATVs with engines less than 200cc were involved in fewer deaths in 1996 (11%) compared to 1985 (30%).

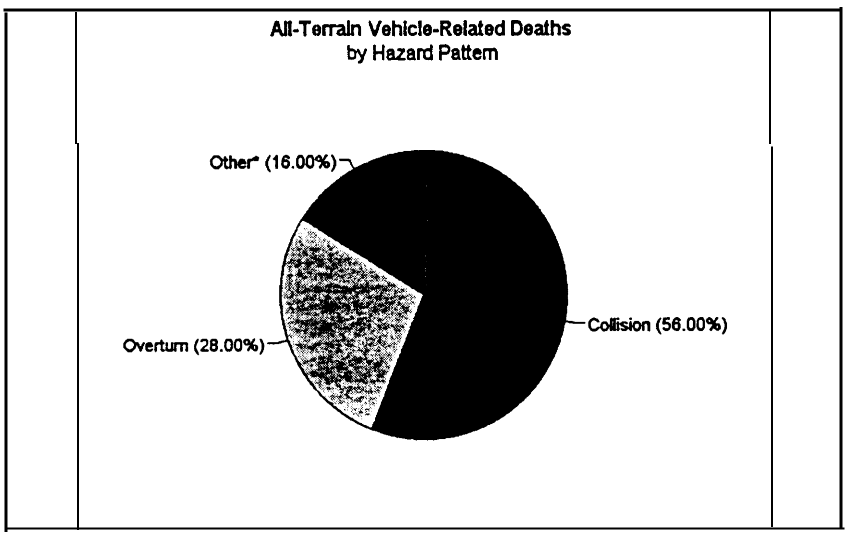
How are the Deaths Occurring ?

The two most frequently reported hazard patterns associated with the approximately 3,200 ATV-related deaths estimated by the Commission were collisions and overturns.

Incidents reported as collisions made up 56 percent of all ATV incidents. More than half of the collisions (about 54 percent) occurred with stationary objects, about 35 percent with motorized vehicles, and 11 percent with people or animals.

The second most frequently reported hazard pattern, overturns, accounted for 28 percent of all ATV-related deaths (Figure 6). Overturns usually occurred as a result of the operator losing control, or while riding up or down hill. Backward overturns occurred more frequently than forward overturns, and rollovers (sideward) occurred with the least frequency.

FIGURE 6



WHERE DID THE INCIDENTS OCCUR ?

Over half the incidents occurred on roadways. Approximately 29 percent occurred on paved roads, and 31 percent occurred on non paved roads. Most were public roads. Sixteen percent of the incidents occurred in fields. Four percent occurred in forested areas, 4 percent on beaches and sand dunes, and 3 percent on yards or lawns. Other types of terrain where incidents occurred include deserts, snow and ice areas, parking lots and railroad beds. These accounted for 15 percent. Only 1 percent of the incidents occurred on ATV tracks or trails.

WHAT ARE THE INTERACTIONS BETWEEN THE VICTIM, DRIVER, AND VEHICLE?

There was no apparent relationship between the age of the driver and the size or type of ATV used by a driver. Proportionately, as many younger (under 16 years of age) drivers used the larger sized ATVs as older drivers. The most notable finding with regard to driver-age and vehicle is that younger children typically did not use the size ATV (under 90cc) recommended as appropriate for their use. More than ninety percent of the child-driver fatalities involved an adult-sized ATV.

PART IV
Report on 1997 ATV Risk Analysis

April 1998

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INTRODUCTION

This report describes the preliminary results of the U.S. Consumer Product Safety Commission's (CPSC) 1997 ATV risk analysis. The analysis is based on the results of the injury and exposure surveys developed and sponsored by the CPSC in 1997. These surveys collected parallel information on the characteristics and use patterns of both drivers involved in injury incidents and the general population of drivers. Data from the surveys were evaluated in a logistic regression analysis to determine and quantify the factors associated with the injury risk.

The results of the analysis are generally consistent with those of the earlier 1986 and 1989 ATV risk analyses conducted by the CPSC (Rodgers, 1986, 1989, 1993; Scheers, Newman, Polen, and Fulcher, 1991). Risk is related to a number of driver and ATV characteristics, including the driver's age, gender, and driving experience, the extent to which ATVs are used for nonrecreational activities, and the number of wheels on the ATVs.

METHODS

Data Sources

Data for the analysis are from two national surveys: a survey of drivers involved in injury incidents that resulted in an emergency department (ED) medical treatment for themselves or their passengers (the injury survey) and a survey of the general population of ATV users (the exposure survey).

Injury Survey. The injury survey collected information on injuries treated in hospital EDs between May 1 and August 31, 1997, and reported through the CPSC's National Electronic Injury Surveillance System (NEISS). NEISS is a stratified national probability sample of hospitals in the U.S. that have at least six beds and provide 24-hour emergency service. The sample currently consists of 101 hospitals which range from large urban or inner-city hospitals with more than 41,000 ED visits to small rural hospitals with less than *17,000* visits annually.

The initial NEISS injury reports were followed up by telephone interviews with injured persons or their representatives (usually a parent or spouse) to collect detailed information on the characteristics of drivers, their ATV use patterns, the characteristics of the ATVs they drove, and injury scenarios?

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[1] For a more detailed description of the injury survey and its results, see Kyle (1998).

Exposure Survey. The exposure survey collected parallel information on the characteristics and use patterns of the general population of ATV users. The survey was designed as a national telephone probability survey of U.S. households owning ATVs (Abt Associates, 1997). It employed a single stage list-assisted random-digit-dialing (RDD) sample design. The list-assisted RDD sample was selected using the latest version of the Marketing Systems Group's proprietary list-assisted RDD system, called the GENESYS Sampling System (MSG, 1997).

The survey was conducted between September 15 and November 18, 1997 (Stoner and Srinath, 1998). Eligible households included those owning one or more ATVs in which at least one of the ATVs had been used by a household member during the preceding 12 months. After ATV-owning households were reached, the initial respondent was asked how many ATVs were owned and how many drivers had used the ATVs during the last year. If there was more than one driver, the driver who had the most recent birthday was selected to be interviewed. If the selected driver was a child under age 16, a parent or guardian was asked to respond on the child's behalf. Interviews were completed with 464 ATV drivers.[2]

Data Adjustments. Several adjustments were made to the injury and exposure databases prior to the statistical analysis to avoid the possibility of bias. Because the exposure survey was limited to drivers from ATV-owning households, injury observations involving drivers from non-owning households were excluded from the risk analysis.

Observations from the exposure survey were excluded from the analysis if respondents reported that they had been involved in an ATV accident requiring medical treatment after May 1, 1997. The inclusion of such observations would have marred the comparison between injured drivers (from the injury survey) and uninjured drivers (from the exposure survey) because some of those labeled as uninjured from the exposure survey would have actually been injured drivers.

Finally, exposure survey respondents who reported that they used their ATV entirely for commercial or occupational tasks other than farming or ranching were excluded from the analysis because NEISS does not systematically collect data on those types of occupational injuries.

The final data set includes 133 injury observations and 457 exposure (i.e., noninjury) observations. Given the data adjustments just described, and the survey methodology, the injury and exposure databases are assumed to provide

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[2]For a more detailed description of the methodology and results of the ATV exposure survey, see Rodgers (1998).

representative national samples of drivers who are involved in injury incidents resulting in ED medical treatment, and drivers who are not.

Statistical Methodology

The statistical analysis is based on a multiple-regression technique known as "logit analysis." This is a special type of regression analysis used to evaluate the relationship between a dichotomous outcome variable, such as (in this case) whether or not an injury resulting in ED treatment has occurred, and a set of independent variables. We conducted the analysis with SUDAAN software, a statistical package designed for the analysis of complex sample surveys (Shah, Barnwell, and Bieler, 1997).

The logit regression model can be used to determine the independent impact of each of several factors on the injury risk, and is especially useful when (as in the case of ATVs) a large number of factors simultaneously affect the injury risk. For example, we might wish to determine the impact of a driver's age on the injury risk. The logit model statistically "holds constant" the other variables to isolate the impact of the age on risk.

The Risk Model. The risk of ED injury is assumed to be a function of driver characteristics, use patterns, and vehicle characteristics. The primary variables evaluated in the analysis include the age, gender, driving experience, and riding time of the driver, the proportion of time ATVs are used in nonrecreational (as opposed to recreational) activities, the engine size and number of wheels on the primary ATV used, and whether or not the **ATV** had been substantially modified. These variables are defined in Table 1.

RESULTS

Table 2 presents the results of three regression models. The first (Model 1) is the base model. Models 2 and 3 are included for purposes of comparison. Note that some of the eligible injury and exposure observations were not included in the analysis due to missing information on variable values. However, a sensitivity analysis, conducted by replacing missing values with the mean value of the variable in question (Pindyck and Rubinfeld, 1991), indicated that the results were not substantially affected by the missing data.

The Model 1 results indicate that risk declines with age, driving experience, and the percentage of time that ATVs are used in nonrecreational activities. With respect to the dichotomous independent variables, risk is higher for those who ride three-wheel ATVs and for males. Risk is positively correlated with both engine size and monthly driving times, but neither relationship is statistically significant.

Model 2 excludes the nonsignificant driving time variable, a variable for which there was a relatively large number of unknown values. Its exclusion increases the number of observations used in the analysis, but does not substantially affect the coefficients for the remaining variables. Nor were the results substantially altered in Model 3, which (like the 1986 and 1989 risk analyses) included both the driving time and modification *(Mod)* variables. The coefficient for Mod is highly significant, suggesting that the presence of a major modification was negatively correlated with the injury risk. While it is possible that some modifications might increase the safety of ATVs (i.e., suspension modification or changing tires or wheels), this inverse relationship may be more likely to reflect an expertise on the part of ATV drivers who have modified their vehicles.

The risk implications of the Table 2 regression models are illustrated in Graphs 1 through 3. Model'1 is used as the basis for estimating the relationships in all three graphs. Unless otherwise indicated in the graph, the annual injury risks (i.e., the risk of emergency department medical treatment) are for a 30-year-old male driver with eight years of driving experience and who rides a four-wheel 250cc ATV recreationally for about 25 hours in an average month of driving.

The first graph illustrates the inverse relationship between age and risk, and the higher risks on three-wheel ATVs. Risk on a four-wheel ATV increases from .33% per year (i.e., one-third of one percent) for a 40-year-old male to about .48% per year for a 30-year old male driver, an increase of about 45%. On the other hand, if all other factors are held constant, the risk of nonfatal injury on a three-wheeler is about 2.85 times the risk on a four-wheeler. In our example, risk increases from about .48% for the 30-year-old four-wheel ATV driver to about 1.37% per year for the same driver on a three-wheeler.

Graph 2 shows the relationship between the injury risk and nonrecreational use. Risk declines as the proportion of total driving time devoted to nonrecreational use (as opposed to recreational use) increases. In other words, the nonrecreational use of ATVs is generally less risky than recreational use. For example, risk declines from about .39% per year for a 30-year-old male driver of a four-wheel ATV who engages in nonrecreational activities 10% of the time to about .13% per year for a similar driver who engages in nonrecreational activities 67% of the time.

Finally, Graph 3 illustrates the relationship between driver experience and risk and between the gender of the driver and risk. Risk declines rapidly as drivers first learn to drive ATVs, but the rate of decrease declines as drivers becomes more experienced. Additionally, the graph illustrates the higher risks for males. Holding all other factors constant, the risk for males is almost three times the risk for females.

Table 3 shows the results of three additional regression models which are similar to those in Table 2 except that the driver's age is included as a series of categorical variables relative to drivers 55 years of age and older. While the coefficients for the categorical age variables support the inverse relationship between age and risk found in Table 2, they also highlight the relatively high risks for children under the age of 16.

Based on the Model 4 results (and holding all other factors constant), the risk for children under the age of 16 is about 2.5 times higher than for drivers 16 to 34 years of age, and about 4.5 times higher than drivers 35 to 54 years of age. These relative risks are illustrated in Graph 5, using the risks for drivers aged 35-54 as the reference group.

The remainder of the results in the Table 3 risk models are, for the most part, similar to those of Table 2. Risk is higher on three-wheel ATVs, higher for males, higher for drivers who use their ATVs recreationally, and lower on modified ATVs. Driver experience remains negatively correlated with risk, but the coefficient is no longer statistically significant.

While engine size was positively correlated with the injury risk, neither the Table 2 nor Table 3 regression results show a significant general relationship between engine size and risk. However, the regression results shown in Table 4 (which allow the categorical age variables to interact with engine size) suggest a significant positive relationship between engine size and risk for one class of drivers, children under age 16. This is indicated by the positive and significant coefficient for variable denoted as "Age(<16)*Engine Size."

Graph 4 illustrates the relationship between engine size and risk for children. The risk for a male child on a four-wheel ATV, for example, rises from about .63% per year on an 80cc model, for example, to about 1.14% per year on a 180cc model, an increase of about 80%.

Finally, we evaluated the relationship between risk and organized training programs such as those sponsored by the Specialty Vehicle Institute of America (SVIA) under the requirements of the 1988 Consent Decrees.[3] About 3% of the injured drivers and about 11% of the uninjured drivers reported participating in an organized training program. The results, however, were inconclusive, possibly because of the small sample

[3]Under the requirements of the 1988 Consent Decrees, SVIA members offer buyers of new ATVs "free training" as part of the purchase price of a new vehicle. As added inducement, buyers who take the training get a $50 cash payment, a $100 U.S. Savings Bond, or (at the discretion of the distributors) a merchandise certificate in an amount no less than $50.

of riders who had taken such training.

DISCUSSION

The results of the 1997 risk analysis are generally consistent with the CPSC's earlier 1986 and.1989 ATV risk analyses. It shows that the risks associated with ATVs are systematically related to driver characteristics, driver use patterns, and the characteristics of the ATVs driven.

As in the earlier analyses, risk is higher for younger drivers. As described earlier, the estimated risk for children under age 16 is about 2.5 times higher than for drivers 16 to 34 years of age, and about 4.5 times higher than drivers 35 to 54 years of age -- risk differentials that are somewhat higher than in earlier analyses.

Also as in the earlier analyses, the risk on three-wheel ATVs remains significantly higher than on four-wheel models. Current estimates suggest that the risks on a three-wheel model are roughly 2.5 'to 3 times the risk on a similar sized four-wheel model, a somewhat larger differential than in earlier risk analyses. Similarly, risk is higher for male drivers and rises with the proportion of time ATVs are used in recreational activities.

There are, however, some differences worth noting. First, while the injury risk 'increased with engine size for at least one class of drivers, children under age 16, the analysis did not demonstrate a significant statistical relationship between engine size and risk for all drivers generally. This lack of significance may be related to the increasing market share of utility-oriented ATVs with large engines. In contrast to 1989, when few ATVs were four-wheel drive vehicles, the 1997 exposure survey found that about one-fifth of all ATVs in use were four-wheel drive vehicles, most with 300cc or larger engines. These utility-oriented vehicles tend to have low gearing to accommodate heavy loads, and may be used somewhat differently or on different terrains than sports or recreational ATVs with large engines. The lack of statistical significance may also be related to the relatively small sample of observations used in the 1997 analysis (133 injury observations and 457 exposure observations). The 1989 risk analysis, on the other hand, was based on over 1,800 observations (314 injury and 1530 exposure observations), more than three times the number in the 1997 analysis.

Second, while the 1997 analysis indicates that risk is inversely correlated with driving experience, the relationship is not statistically significant in all the regression models. That is, in some of the regression models we could not reject, with a high degree of certainty, the hypothesis of no relationship between risk and experience. The explanation for this lack of statistical significance may be related to some intercorrelations between driver age and experience, in combination with the relatively small sample of observations used in the 1997 analysis.

Additionally, the relationship between experience and risk may have been confounded by a larger percentage of new inexperienced drivers who have participated in organized training programs in recent years, programs which intend to reduce risks for new beginning drivers. Based on industry reports, during the last 10 years about 25% of first-time ATV buyers without experience have participated in the Specialty Vehicle Institute of America (SVIA) training program.[4] Polaris Inc., which negotiated a separate consent decree, requires buyers of the Polaris ATVs to take point-of-sale training before the vehicle warranty can go into effect. This contrasts with the very small percentage of drivers who had participated in organized training programs (2% or less) prior to the 1989 risk analysis.

These findings have several implications. First, the finding of higher risks on three-wheel ATVs supports the stop-sale of three-wheel models that was instituted under the 1988 Consent Decrees. Second, the substantially higher risks for children, in combination with the finding that risk rises with engine size for children, supports efforts to keep young children off adult-sized ATVs. Finally, the inverse relationship between risk and driving experience, in combination with the stronger risk-experience findings from the earlier risk analyses, suggests the need for training programs for beginning drivers.

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[4]Specialty Vehicle Institute of America. *ATV Rider Training Summary.* Irvine, CA: Author, (quarterly reports) 1988-1998.

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Table 1: Explanatory Variable Definitions

Variable	Definition
Age	The age of the driver in years
Age(X-Y)	1 if the driver is aged x to y, 0 otherwise
Female	1 if the driver is a female, 0 otherwise
Hours	the number of hours driven in an **average** month
ln(Exp)	the natural logarithm of years of driving experience
Non-Ret	the number of hours out of 10 that the driver uses ATVs in non recreational activities
Engine Size	engine size in cubic centimeters of displacement
3-Wheel	1 if the ATV driven has three wheels, 0 if the ATV has four wheels
Mod	if the ATV was substantially modified (with different tires or wheels, a special exhaust system, suspension modifications, or an engine high performance kit) , 0 otherwise

Table 2: Logistic Regression Results - Risk of Injury

Variable	Model 1 Coeff	Model 1 Std Err	Model 1 OR(95% CI)	Model 2 Coeff	Model 2 Std Err.	Model 2 OR(95% CI)	Model 3 Coeff	Model 3 Std Err	Model 3 OR(95% CI)
Intercept	-4.753**	.686	.01(0-.03)	-4.189**	.650	.02(0-.05)	-2.408**	.809	.09(.02-.44)
Age	-.037**	.016	.96(.93-.99)	-.045**	.016	.96(.93-.99)	-.036**	.015	.96(.94-.99)
Female	-1.074**	,538	.34(.12-.99)	-1.021**	.506	.36(.13-.98)	-1.297**	.553	.27(.09-.81)
ln(Exp)	-.501**	.241	.61(.38-.97)	-.463**	,230	.63(.40-.99)	-.438*	.232	.65(.41-1.02)
Non Rec	-.214**	.089	.81(.68-.96)	-.227**	.091	.80(.67-.95)	-.244**	.091	.78(.65-.94)
3-Wheel	1.054**	.492	2.87(1.1-7.6)	1.052**	,470	2.86(1.1-7.2)	1.510**	.510	4.53(1.7-12.3)
Engine Size	.002	.002	1.00(1.0-1.01)	.001	.002	1.00(1.0-1.0)	.002	.002	1.00(1.0-1.01)
Hours	.004	.005	1.00(1.0-1.01)				.005	.004	1.01(1.0-1.01)
Mod			-				-2.154**	.452	.11(.05-.28)
N(Injury)	96			117			96		
N(Exposure)	421			434			421		
Adj Wald F	4.15			5.52			5.42		

** Significant at 5%
* Significant at 10%

Table 3: Logistic Regression Results - Risk of Injury

	Model 4			Model 5			Model 6		
Variable	Coeff	Std Err	OR(95% CI)	Coeff	Std Err	OR(95% CI)	Coeff	Std Err	OR(95% CI)
Intercept	-7.133**	1.225	0(0-.01)	-6.412**	1.127	0(0-.02)	-4.947*	1.130	.01(0-.07)
Age(<16)	2.083**	1.005	8.02(1.11-58)	1.819**	.924	6.16(1.0-38)	2.016**	.952	7.51(1.2-49)
Age(16-24)	.992	1.011	2.70(.37-20)	.825	.866	2.28(.4-12.6)	1.338	1.016	3.81(.52-28)
Age(25-34)	1.330	.969	3.78(.56-25)	.853	.865	2.35(.4-12.9)	1.261	.993	3.53(.50-25)
Age(35-44)	.666	1.008	1.95(.26-14)	-.005	.902	.99(.17-5.9)	1.109	1.010	3.03(.42-22)
Age(45-54)	.469	.871	1.60(.29-8.9)	-.036	.882	.96(.17-5.5)	.050	.899	1.05(.18-6.2)
Female	-1.210**	.574	.30(.10-.92)	-1.112**	.537	.33(.11-.95)	-1.321**	.579	.27(.09-.83)
ln(Exp)	-.403	.276	.67(.39-1.2)	-.367	.265	.69(.41-1.2)	-.377	.265	.69(.41-1.2)
Non-Rec	-.240**	.090	.79(.66-.94)	-.252**	.092	.78(.65-.93)	-.260**	.093	.77(.64-.93)
3-Wheel	.926*	.511	2.52(.92-6.9)	.971**	.476	2.64(1.03-6.7)	1.548**	.541	4.70(1.6-13.6)
Engine Size	.002	.002	1.00(1.0-1.01)	.002	.002	1.00(1.0-1.01)	.003	.002	1.00(1.0-1.01)
Hours	.005	.005	1.00(1.0-1.01)	-	-	-	.005	.005	1.01(1.0-1.01)
Mod	-	-	-	-	-	-	-2.194**	.504	.11(.04-.30)
N(Injury)	96			117			96		
N(Exposure)	421			434			421		
Adj Wald F	2.96			3.80			3.80		

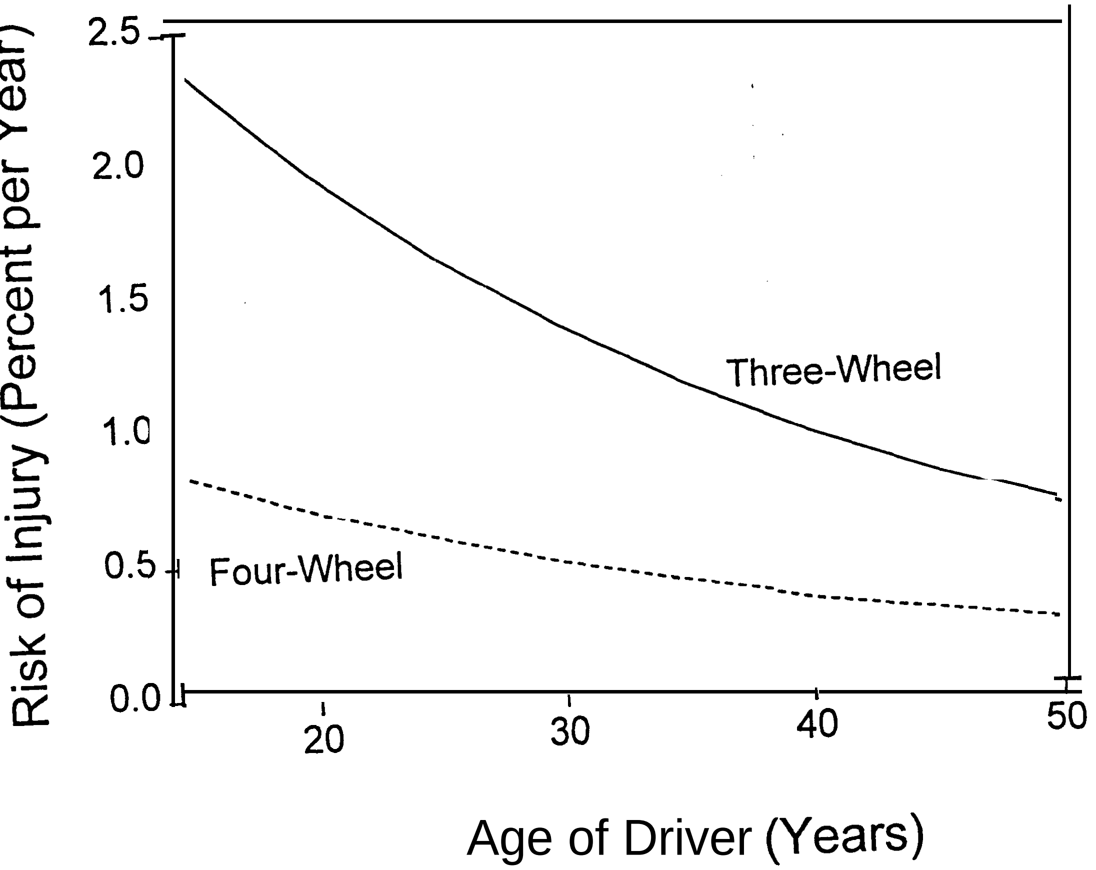
** Significant at 5%
* Significant at 10%

Table 4: Logistic Regression Results - Risk of Injury

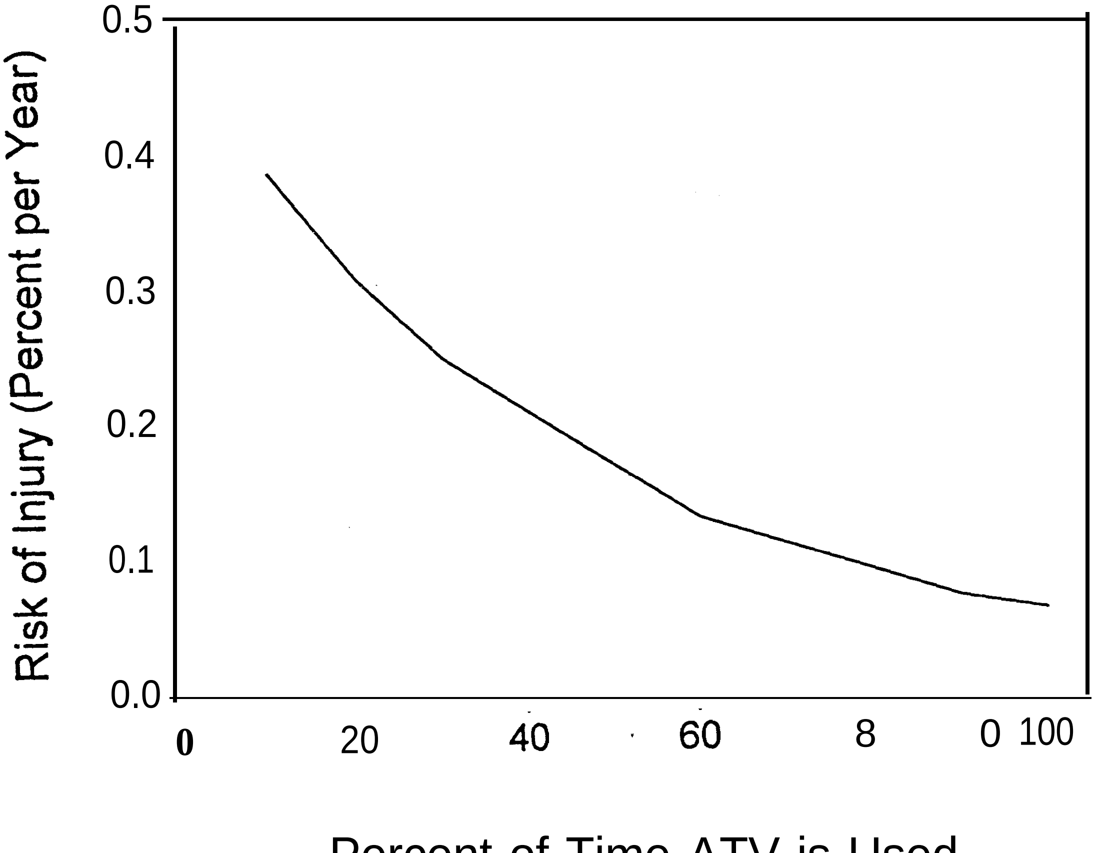
Va able	Coeff	Std Err	Odds Ratio (95% CI)
Intercept	-6.0681**	.7796	.002(0.001-0.011)
Age(<16) * Engine Size	.0060**	.0025	1.006(1.001-1.011)
Age(16-24)*Engine Size	.0010	.0022	1.001(0.997-1.005)
Age(25-34)*Engine Size	.0018	.0019	1.002(0.998-1.006)
Age(35-44)*Engine Size	.0007	.0024	1.001(0.996-1.005)
Age(45-54)*Engine Size	-.0007	.0024	.999(0.995-1.004)
Age(>54) * Engine Size	-.0034	.0040	.997(0.989-1.005)
Female	-1.2011**	.5972	.301(0.093-0.975)
ln(Exp)	-.3200	.2738	.726(0.424-1.245)
Non-Rec	-.2448**	.0878	.783(0.659-0.931)
3-Wheel	.9862**	.4960	2.681(1.010-7.118)
Hours	.0056	.0042	1.006(0.997-1.014)
N(Injury)	96		
N(Exposure)	421		
Adj Wald F	2.97		

** Significant at 5%
* Significant at 10%

Graph 1: Risk of Injury by Age of Driver
(For Both Three- and Four-Wheel ATVs)

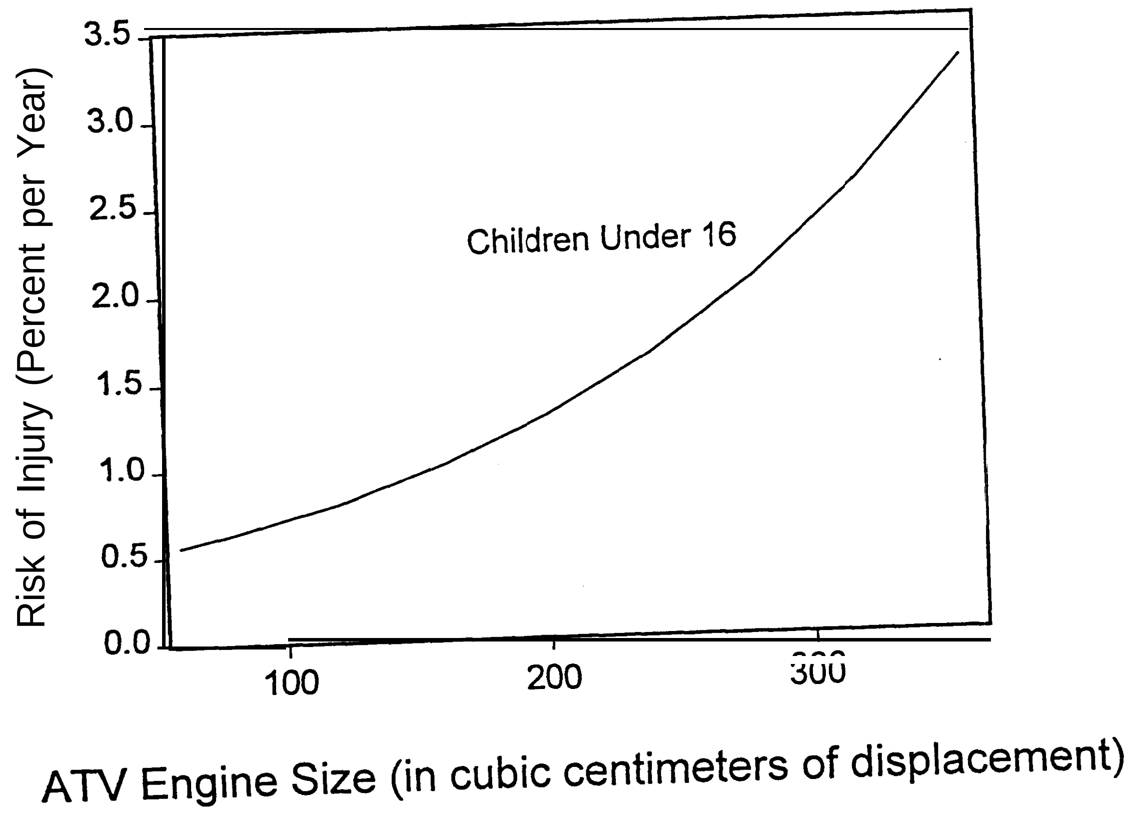


Graph 2: Risk of Injury by Type of Use (Recreational vs. Nonrecreational)



Graph 3: Risk of Injury by Driver Experience
(for females and males)

Graph 4: Risk of Injury for Children Under Age 16 by ATV Engine Size



Graph 5: ATV Risks by Driver Age Group
(Relative to Risks for Drivers Age 35-54)