

ANALYSIS OF HUNTING ACCIDENTS IN VIRGINIA

JAMES N. KERRICK, Virginia Commission of Game and Inland Fisheries, Richmond VA 23230

PETER T. BROMLEY, Department of Fisheries and Wildlife Sciences, Virginia Polytechnic Institute and State University, Blacksburg, VA 24061

RICHARD G. ODERWALD, Department of Forestry, Virginia Polytechnic Institute and State University, Blacksburg, VA 24061

Abstract: Using hunting accident report forms filled out by Virginia game wardens from July 1961 to June 1977, we analyzed the conditions related to 972 hunting casualties. Virginia statistics are compared with data for the United States for 1970. All data were reported on National Rifle Association (NRA) Uniform Hunter Casualty Report forms. Approximately half of the accidents in Virginia were caused by judgment errors. About 20% involved lack of skill. Fifteen percent occurred when safety rules and state laws were violated. Approximately 3% were due to defective firearms. National accident statistics were roughly equivalent to Virginia statistics. In Virginia, 47% of the accidents occurred when hunters sought big game, primarily whitetail deer. However, Virginia hunters spent 28% of their time big game hunting. The preponderance of accidents involved people under 25 years of age and having less than 5 years experience. Although 8% of hunters are women, this sex accounted for less than 2% of the accidents. Approximately 10% of people involved in hunting accidents in Virginia were not licensed. Only 1% of the shooters who caused accidents admitted to the game warden that they were intoxicated or on drugs, however we expect that this is an underestimate due to reporting bias. Accident rates were higher through the middle of the day than during early morning, evening and night. For 410 accidents, 39% occurred in dense cover, 43% in moderate cover and 19% in open fields. Over 75% of casualties due to poor judgment occurred at distances from 11 to 100 yards. About 70% of accidents involved shotguns and 24% involved rifles. Graduates of hunter education courses caused significantly fewer accidents with shotguns than did untrained hunters. Under dim light conditions 2.2% of 89 victims were wearing bright colored hunting clothes when injured. Under the same conditions, 11.5% of 286 victims were wearing non-bright clothing when injured. Graduates of hunter education courses were proportionately less likely to commit judgment errors than untrained hunters. Several recommendations for improving the NRA Uniform Hunter Casualty Report form were made. It was concluded that the accident data should be integrated into hunter education courses to add realism and stimulate defensive attitudes. Graduates should know and adjust to the risks of sport hunting.

Proc. Ann. Conf. S.E. Assoc. Fish & Wildl. Agencies 32:840-849

A primary responsibility of government agencies is to encourage public safety. The agencies responsible for game management and administration of public hunting in each of the 50 states provide hunter education courses to teach safe handling of firearms, ethical conduct of hunters and principles of game management. Between October 1961 and July 1977 the Virginia Commission of Game and Inland Fisheries voluntary hunter safety program was taken by more than 192,000 people (Table 1). During that time, detailed information on 972 hunting casualties was reported by game wardens on NRA Uniform Hunter Casualty Report forms. We analyzed the 16 years of data to determine whether or not the safety training program has been effective and to point out areas where the program should be improved.

In order to place this analysis in perspective, the characteristics of the Virginia hunter safety program must be described. Starting in 1961, the Virginia program has relied fundamentally on educational materials provided by the NRA. Instructors of the program take an 8-hour course from education specialists in the Education or Law Enforcement Divisions of the Game Commission. All instructors meet NRA standards and are registered by both NRA and the Game Commission. Students take a 6-hour course and upon passing a multiple choice examination, the students receive a certificate and are registered by the NRA. The details presented to the students vary from class to class, but the general content is controlled because of the standardized training manuals and examinations. Since 1961, content of the course has changed with revisions of the training manuals and incorporation of better training aids.

Graduates over the years and within each year's classes vary in their knowledge of safety and in their ability to make safe decisions in the field, but the degree of this

Table I. Numbers of licensed hunters, graduates of hunter education programs, accidents, and number of accidents per 100,000 licensed hunters, and number of fatalities in Virginia from July 1961 to June 1977.

<i>Year</i>	<i>Number of Hunting Licenses</i>	<i>Number of Hunter Education Graduates</i>	<i>Number of Accidents</i>	<i>Accidents per 100,000 Licenses</i>	<i>Number of Fatalities</i>
1961-1962	376,156	886	44	11.7	10
1962-1963	371,835	5,086	40	10.6	5
1963-1964	373,700	2,434 ^a	44	11.2	7
1964-1965	390,484	1,736 ^a	57	14.6	13
1965-1966	385,547	10,811 ^a	57	14.8	9
1966-1967	389,834	11,613	45	11.5	7
1967-1968	393,803	11,250	46	11.7	7
1968-1969	419,482	11,188	46	11.0	8
1969-1970	433,942	9,508	69	15.9	8
1970-1971	450,554	9,600	79	17.5	13
1971-1972	458,083	9,740	73	15.9	10
1972-1973	481,015	14,514	61	12.7	11
1973-1974	503,330	21,194	78	15.5	12
1974-1975	448,226	30,249	78	17.4	14
1975-1976	448,674	21,169	77	17.2	13
1976-1977	446,588	21,644	78	17.5	16
Total	6,771,253	192,672	972		163

^aData reporting not accurate these years.

variation is not known. This is the first of four major constraints on statistical analysis of the data.

The second limitation is due to changes in the hunting environment. In 1961 there were 376,156 licensed hunters in Virginia. In 1977 there were 446,588 licensed hunters, an increase of nearly 20%. The extent of lands open to hunting has decreased due to development and to posting, but the actual loss is not known. The increase in hunter density probably has resulted in a higher incidence of accidents between hunters of different parties. In addition, the background of new hunters has become increasingly urban. When compared to conditions in the early 1960's, there are more hunters on less space and fewer hunters were raised in rural settings where hunting is a regular part of life.

The proportion of safety-trained hunters in the hunting population over the duration of the study is not known. This constraint prevents unequivocal conclusions on whether or not trained hunters are safer than untrained hunters.

Fourth, there is apt to be bias in the reports given to game wardens by hunters who caused accidents. Inaccuracies in the reported information are almost certain due to emotional trauma, embarrassment or fear of shooters who caused accidents.

While the 4 limitations constrain interpretations from the data, we believe the analysis is valuable. The NRA Uniform Hunter Casualty Reports completed by game wardens included information on the age, sex, and experience of the shooter, whether or not the shooter had completed a hunter education course, and rather complete information on the causal situation. These data permit statistical comparison between graduates and non-graduates of hunter education courses on each of the other variables listed on the accident reporting form.

We gratefully acknowledge the Game Wardens of the Virginia Commission of Game and Inland Fisheries who have reported the details of the hunting casualties since 1961. Also, we thank R. H. Giles, Jr., P. F. Scanlon, and C. J. Cowles of the Department of Fisheries and Wildlife Sciences, Virginia Polytechnic Institute and State University for their critical review of an earlier draft of this paper.

METHODS

The information on hunting accidents was gathered by game wardens. By law, physicians report all gunshot wounds to police. Game wardens are informed of hunting casualties by police. Between 31 July 1961 and 30 June 1977, all wardens in Virginia filled out 972 accident reports using the NRA Uniform Hunter Casualty Report (Table 1). Data from these forms was tabulated manually and by computer. Tests of statistical significance were based on analysis of proportions.

RESULTS

Causes of Hunting Accidents

Accidents reported for Virginia from 31 July 1961 to 30 June 1977, and those from the 1971 Uniform Hunter Casualty Report for the United States are divided into major causal groups in Table 2. The groups are judgment, skill, violating rules and laws, mechanical and unknown. "Judgment" includes casualties caused by shooter who fired when victims moved into the line of fire, shot victims when swinging firearms on game, and mistook victims for game. The "skill" category includes situations in which victims stumbled and fell, the triggers of firearms caught on objects and discharged, and discharge of firearms during loading or unloading. Accidents attributed to "violation safety rules and state laws" occurred while the shooter was clubbing cover or game, removing a firearm or placing a firearm in a vehicle, riding in a vehicle with a loaded gun, engaging in horse-play with a loaded firearm, crossing obstacles improperly, or when the victim was shot by a firearm which fell from an insecure rest. Accidents due

Table 2. Causes of hunting accidents in Virginia from July 1, 1961 to June 30, 1977 and in the United States in 1970^a.

CAUSES	VIRGINIA		UNITED STATES	
	No.	Percent	No.	Percent
<i>Judgment</i>				
Victim moved in line of fire	46	4.7	287	13.9
Victim covered by shooter swinging on game	99	10.2	193	9.4
Victim out of sight of shooter	136	14.0	210	10.2
Victim mistaken for game	194	20.0	180	8.7
Group Subtotal	475	48.9	870	42.2
<i>Skill</i>				
Shooter stumbled and fell	99	10.2	193	9.4
Trigger caught on object	61	6.3	71	3.4
Loading firearm	26	2.7	39	1.8
Unloading firearm	24	2.5	35	1.7
Group Subtotal	210	21.7	338	16.4
<i>Violating Rules and Laws</i>				
Clubbing cover or game	11	1.1	34	1.6
Removing firearm from or placing firearm in vehicle	45	4.6	66	3.2
Riding with loaded firearm	16	1.6	24	1.2
Firearm fell from insecure rest	29	3.0	35	1.7
Horseplay with loaded firearm	21	2.2	32	1.6
Improper crossing of obstacles	27	2.8	63	3.1
Group subtotal	149	15.3	254	12.4
<i>Mechanical</i>				
Defective firearm	29	3.0	59	2.9
<i>Other or Unknown Causes^b</i>				
	109	11.2	537	26.2
TOTAL	972	100.1	2058	100.1

^aData from NRA 1971 Uniform Hunter Casualty Report.

^bIncludes all unusual, accidental and unique causes generally beyond the control of the shooter.

to "mechanical causes" were from defective firearms. Accidents rated as "unknown" included all unusual, accidental and unique causes generally beyond the control of the shooter.

Although differences in the proportions of accidents in each causal group exist between Virginia and the United States, these differences are not prominent. Findings for Virginia may be applicable for other states. Nearly 50% of the casualties in Virginia and over 40% of the casualties nationally were due to judgment errors. Approximately 20% of accidents were due to a lack of skill by the firearm handler. Violation of safety rules and laws accounted for about 15% of accidents. Mechanical failures of firearms caused only 3% of the accidents. The percentage statistics suggest weights in time, teaching aids and examinations for hunter education programs.

Accidents by Type of Game Hunted

The 972 accidents were distributed as follows: 445 while big game hunting, 432 small game hunting, 61 non-game mammal hunting, 17 non-game bird hunting and 17 during unknown conditions (Table 3). According to the Virginia Addendum to the 1975 National Survey of Hunting, Fishing and Wildlife-Related Recreation report (U.S. Fish and Wildlife Service 1977), hunters in Virginia spent 28% of their time big game hunting, 53% small game hunting and the remainder of their time hunting non-game mammals and birds. Big game hunting accounted for 47% of accidents, which is far greater than the proportionate time spent big game hunting would predict. Hunter educators should emphasize the relative hazards of deer hunting to motivate the students to take special safety precautions when deer hunting.

Accidents by Age of Shooter

Fig. 1 charts the ages of shooters causing 873 hunting accidents, in which the age of the shooter was recorded. The preponderance of accidents are caused by people under 25 years of age. Since the hunter education program in Virginia is adjusted for persons 12 years old and older, no change in this variable is recommended. We do note that 24 injuries involved shooters from 5 to 11 years of age. In Virginia there is no minimum age requirement to hold a hunting license. A minimum age of 12 years might reduce casualties among the youth. A further requirement that hunters 12 to 14 years of age be accompanied by licensed adults might be advisable.

Table 3. Accidents by type of game hunted, 1 July 1961 - 1 June 1977.

<i>Large Game</i>		<i>Small Game</i>	
Deer	357	Squirrel	170
Bear	6	Rabbit	164
Turkey	82	Quail	50
Total	445	Dove	29
		Goose	2
		Grouse	7
		Duck	8
		Pheasant	2
		Total	432
<i>Other Mammals</i>		<i>Other Birds</i>	
Raccoon	7	Blackbirds	7
Woodchuck	39	Non-game Bird	1
Muskrat	1	Song Birds	1
Bobcat	1	Crow	6
Rodent	2	Sparrow	1
Fox	5	Hawks	1
Skunk	1	Total	17
Wild Dogs	1		
Snake	1		
Predators	3		
Total	61	UNKNOWN	17

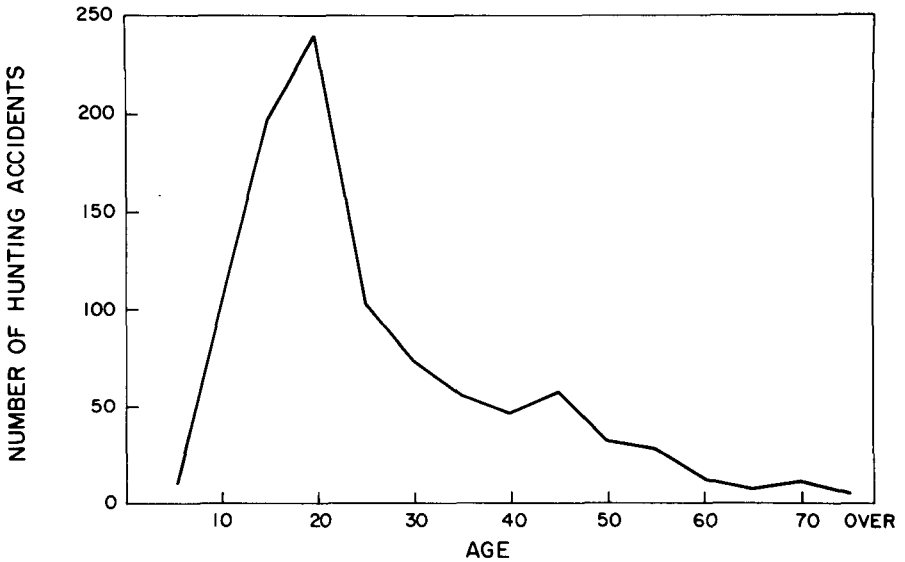


Fig. 1. Hunting accidents by age of shooter.

Accidents by Experience of Shooter

Forty-five percent of hunting accidents were caused by hunters with less than five years experience (Fig. 2). The average years experience of the shooters was 8 for graduates of education courses and 13 for untrained shooters. These data are difficult to interpret. As experience increases it seems logical that judgment and skill should increase and that the probability of causing an accident should decrease. Is it possible that experienced hunters assume they are safe hunters and become complacent? If so, hunter safety programs should be developed especially for the experienced hunter.

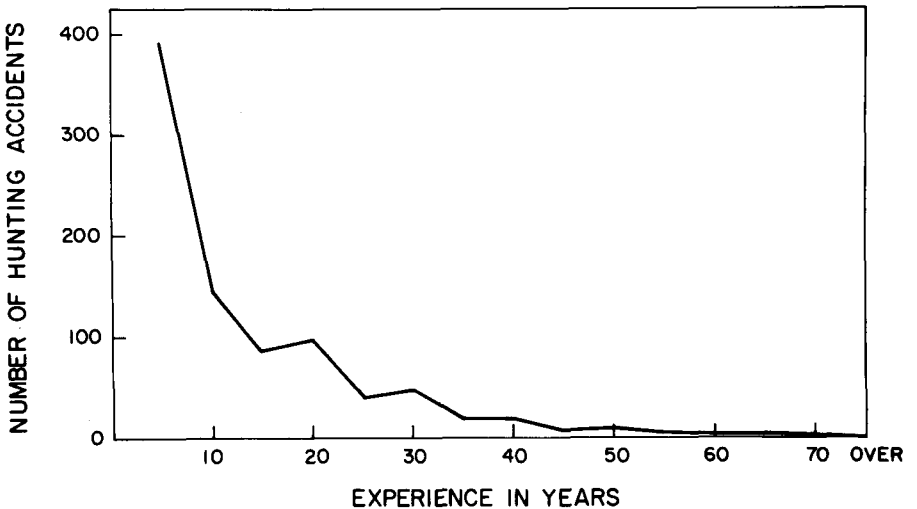


Fig. 2. Hunting accidents by experience of shooter.

Accidents by Sex of Shooter

Women caused only 6 of 874 accidents in which the sex of the shooter was reported. According to the NRA 1971 Uniform Hunter Casualty Report, only 1.4% of 1454 accidents were caused by women in 1970. The 1975 National Survey of Hunting, Fishing and Wildlife-Associated Recreation report states that 8% of all hunters in 1975 were women. It appears that women are safer than men.

Accidents by Licensing of Shooter

Unlicensed shooters caused about 9% of 875 accidents. Unlicensed victims were involved in about 10% of 662 accidents. These data do not reflect on the hunter education program, but they do suggest that as many as 1 out of every 10 hunters in Virginia hunts illegally.

Accidents by Intoxication and Drugs

Approximately 1% of shooters causing 888 accidents admitted to being intoxicated or on drugs at the time of the accident, according to the warden reports. Likewise, approximately 1% of 683 victims were reported as intoxicated or on drugs at the time of the accident. Since the accident reports are filled out some time after the accidents occur and since most hunters would not willingly admit to being under the influence of either drugs or alcohol, 1% is an underestimate. However, the popular belief that most accidents are caused by drunks seems a myth.

Accidents by Time of Day

Without information on the density and activity patterns of hunters in the field, it is difficult to interpret the data on the times of day accidents occurred. Fig. 3 shows that relatively few accidents occurred at night, at dawn, or at dusk. Rates per hour of the day were higher and roughly equivalent for morning, mid-day and afternoon. Light conditions are not a problem during these periods. Hunters need to be safety conscious throughout the day.

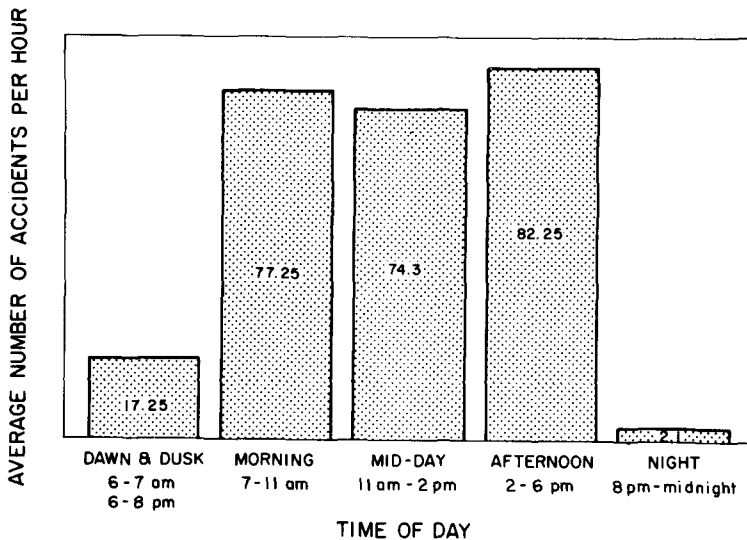


Fig. 3. Times of hunting accidents.

Accidents by Type of Cover

In 410 accidents in which the type of cover was recorded, 39% occurred in dense woods or brush, 43% occurred in light woods or brush and 18% occurred in open fields. In the 1971 NRA Uniform Hunter Casualty Report 1396 accidents were categorized with 30% in dense cover, 32% in light cover and 38% in open cover. Since we know neither distribution of hunters in relation to cover type nor the extent of the various cover types

available to hunters, we cannot assign a hazard rating by cover type. As with the time of day data, we suggest informing hunters that accidents occur in all cover types.

Accidents by Distances from Firearms

Table 4 presents data showing that 49.6% of victims in Virginia, from 1961 to 1977, and 59.4% of accidents in the United States were within 10 yards of the firearm. The proportions of accidents at greater distances decrease rapidly, with less than 10% occurring at distances over 100 yards from the firearm. The meaning of these data is unclear due to the various causal situations of accidents and to inclusion of self-inflicted injuries,

Table 4 presents data showing that 49.6% of victims in Virginia, from 1961 to 1977, 1977 and in the United States in 1970^a.

<i>Distances (yards)</i>	<i>Virginia</i>		<i>United States</i>	
	<i>Number of Casualties</i>	<i>Percent</i>	<i>Number of Casualties</i>	<i>Percent</i>
0-10	427	49.6	871	59.4
11-50	247	28.7	364	24.8
51-100	135	15.7	155	10.6
Over 100	52	6.0	76	5.2
Total	861	100.0	1466	100.0

^aData from National Rifle Association 1971 Uniform Hunter Casualty Report.

which comprised 30% of accidents in Virginia from 1961 to 1977 and 34% of 2050 accidents in the United States in 1970. Some of the problems in interpretation of the Virginia data are cleared up when the distances between firearms and victims are separated by causal group (Table 5). A sharp distinction can be made between accidents caused by poor judgment and by the other 3 causes. Over 75% of casualties due to poor judgment occurred from 11 to 100 yards from the shooter, while in each other category over 75% of the accidents occurred within 10 yards of the shooter. Many of the accidents occurring close to firearms were self-inflicted.

Our recommendation derived from the data on distances between victims and firearms is that hunter safety courses should stress accurate identification of target game animals and people at various distances from the hunter and under various cover conditions. These data also suggest that the frequency of accidents could be reduced by regulation of the density of hunters and by informing hunters of the location and numbers of other hunters. Both of these procedures are followed at the 3 military bases open to public hunting in Virginia.

Table 5. Distances between victims and firearms related to causal groups in Virginia from 1961 to 1977.

<i>Causal Groups^a</i>	<i>Number of Accidents in Group</i>	<i>Percentage of Casualties Which Occurred at Distances Between Victims and Firearms</i>			
		<i>0-10 yards</i>	<i>11-50 yards</i>	<i>51-100 yards</i>	<i>Over 100 yards</i>
Judgment	431	9.3	50.1	28.8	11.8
Skill	201	91.5	7.0	1.0	0.5
Violating Rule or Law	144	95.1	3.5	1.4	0.0
Mechanical	85	77.6	14.1	8.2	0.0

^aCausal groups defined in text.

Accidents by Type of Firearm

In 876 accidents the type of firearm involved was reported by wardens. Of these shotguns were involved in 71.6% of the casualties, rifles were involved in 24.4%, handguns were involved in 3.7% and bows were involved in 0.3%. The NRA 1971 Uniform Hunter Casualty Report shows shotguns involved in 57.9% of casualties, rifles in 30.8%, handguns in 7.9% and bow in 1.8%. Virginia hunters probably hunt more with shotguns and less with rifles than other American hunters.

Since we had individual accident reports, we analyzed the relationship between the type of weapon involved in an accident and whether or not the shooter had completed a hunter training course (Table 6). The ratios shown in the table are significantly different, suggesting that graduates of hunter education courses in Virginia hunted less with shotguns and more with rifles than untrained hunters, and/or that trained hunters were safer with shotguns but more careless with rifles than untrained hunters. We suspect that hunter safety programs give students more contact with shotguns than with rifles and therefore that graduates are safer with shotguns than hunters who have not been trained. Most (88%) accidents involved shotguns or rifles. Students in hunter education courses should become personally familiar with operation and capabilities with both types of firearms. Self-study courses should include a statement to this effect signed by the student and witnessed by a responsible adult.

Table 6. Types of weapons involved in accidents in relation to hunter education background of shooters in Virginia from 1961 to 1977.

Background of Shooter	Number of Accidents	Percentage of Accidents Involving Various Types of Weapons			
		Shotgun	Rifle	Handgun	Bow
Trained	70	57.1	37.1	5.7	0
Untrained	660	73.9	22.6	3.5	0

Accidents by Color of Victims Clothing

It is standard practice for hunter educators to emphasize wearing bright colors, such as blaze orange. The proportion of all hunters wearing bright attire is not available. Therefore the question of whether or not hunters who wear bright colors are safer than hunters without bright colors cannot be addressed directly. It is logical to suppose that the safety value of bright hunting clothes increases as the visibility in the hunting field decreases. The hypothesis can be tested since information on casualties included both the clothing color and visibility conditions (Table 7). Under poor light conditions such as those associated with rain, snow, fog and dawn or dusk and when in darkness, hunters who wore bright clothes were injured proportionally about 5 times less frequently than hunters who were not wearing bright colored hunting attire.

The emphasis in hunter education programs on wearing blaze orange when hunting all North American game animals except turkey and waterfowl with any firearms, except for bow and arrow, seems justified. Since such a high proportion of accidents takes place while deer hunting and since deer hunters are frequently in the field under poor and bad visibility conditions, we strongly recommend use of blaze orange for deer hunters during rifle and shotgun seasons.

Table 7. Relationships between brightness of hunting clothes, visibility conditions and casualties in Virginia from 1961 to 1977.

Hunting Clothing Color	Number of Casualties	Percentage of Casualties under poor and Bad Visibility Conditions
Bright	89	2.2
Not Bright	286	11.5

Accidents by Completion of Hunter Education

Shooters who caused hunting accidents were asked if they had completed a course in hunter education. If hunter education programs in Virginia have been successful, then graduates of the courses should have been responsible for proportionally fewer accidents than untrained hunters. Unfortunately we cannot answer this question because we do not know the proportion of hunters who graduated from an approved course and did not cause accidents for each year. Graduates of hunter education courses who caused accidents in effect flunked their final exams, just as surely as did those who caused accidents without the chance to learn safe procedures from qualified instructors. In 729 accidents where the training background of the shooters was known, there were 104 fatalities. About 10% of the shooters had hunter safety programs and these shooters caused approximately 9% of fatal accidents.

Even though the fatality rates for shooters with and without hunter education were the same, analysis of the distribution of accidents by causes between the groups suggests that safety training did have an effect (Table 8). Of the accidents caused by trained hunters, 36.2% were due to judgment errors. The percentage for untrained hunters was 48.9. This difference is statistically significant ($p < 0.05$). Our interpretation is that even though the trained hunters committed accidents in other ways, the message 'be sure of your target before you pull the trigger' got through. Comparison of the proportions of accidents caused by a lack of skill reveals a reversal. Casualties caused by lack of skill, such as falling with the firearm or being shot while loading or unloading a firearm, comprised 34.8% of the accident pool for the trained hunters as compared to 23.3% of accidents caused by untrained hunters. The ratios are significantly different ($p < 0.05$). Since untrained hunters had an average of 5 years less experience than trained hunters, this difference in skill-related accidents is not overly surprising. In the remaining categories of violating laws and safety rules and being injured by mechanical causes, the two groups were not significantly different.

Table 8. Relationship between completion of hunter education program and causal groups of accidents.

<i>Causal Group</i>	<i>Casualties Caused by Trained Shooters</i>		<i>Casualties Caused by Untrained Shooters</i>	
	<i>Number</i>	<i>Percent of Total</i>	<i>Number</i>	<i>Percent of Total</i>
Judgment	25	36.2	304	48.9
Skill	24	34.8	145	23.3
Violating Laws and Rules	11	16.0	112	18.0
Mechanical	9	13.0	61	9.8
Total	69	100.0	622	100.0

Recommendations on the NRA Uniform Hunter Casualty Report Form and Data Needs

The NRA Uniform Hunter Casualty Report form has proven a valuable tool in standardizing information gathering. The questions asked are appropriate, but the answer blocks are not equivalent throughout the form. Consequently, key punch operators made frequent errors. One question that should be asked is whether or not the victim had completed a hunter education program. We expect that the safety-trained hunter will not only cause fewer accidents but also that this hunter will avoid dangerous situations and therefore be less likely to become injured than the untrained hunter. We emphatically recommend continued use of the NRA Uniform Hunter Casualty Report form.

Revision of the casualty report form will not result in data needed to resolve the crucial questions raised in this paper. Each year, the number of licensed hunters who graduated from the hunter education programs should be known. This could be accomplished by recording the social security number of the hunter on the license application

and upon hunter completion of the education course. Social security numbers should be recorded for both shooters and victims on the NRA Uniform Casualty Report. Determination of the effectiveness of blaze orange will require field work under a variety of hunting conditions.

DISCUSSION

Even though this analysis was constrained by the absence of data on the hunting population as a whole, the analysis of the available data on accidents brought out significant findings on virtually every aspect of hunting casualties. We want to draw attention to a general recommendation. The future of sport hunting and the agencies which regulate hunting depends in part upon the behavior of hunters. Every reasonable person is concerned about his personal safety. The primary and immediate goal of the hunter education course should be to produce "defensive hunters" who use the facts on hunter accidents to avoid harm to themselves and others. Once this mentality is established, educating hunters on the finer aspects of sport hunting including ethical conduct of the hunter, traditions, and techniques of hunting and game management should be relatively successful. At a time when public hunting is coming under increasing scrutiny, it behooves the sport hunting fraternity and their agencies to use every legitimate tool to upgrade the quality of hunter behavior and safety and to document progress.